Metals Review

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N. E. Promisel, Chairman of A.S.M. Metals Handbook Committee

Nate Promisel has achieved distinction in an area of metallurgy which was practically nonexistent prior to World War II, an area which he and a few other dedicated scientists helped in large measure to create—that of government-sponsored metallurgical research and development. For a testimonial to the current national importance of this field one need only glance through the acknowledgments published with papers in *Metal Progress,* the Transactions of A.S.M. or of other technical societies, or talk to any recent Ph.D. graduate in metallurgy to learn of the extensive contributions to American research and development in metallurgy now being made by the government.

Mr. Promisel was well prepared for the task which he has made his life's work. After receiving his B.S. and M.S. degrees in electrochemical engineering from M.I.T., he continued his studies at Yale University, concentrating there on metallurgy and X-ray diffraction. His post-academic career started at the International Silver Co., where as research electrochemist, and later as assistant director of research, he performed and supervised research and development work in a variety of chemical, electrochemical, metallurgical and fabricating fields. He left in 1940 to engage in private consulting work in chemistry, metallurgy, electrochemistry and metal finishing.

With the outbreak of World War II, Mr. Promisel moved closer to the war effort, to the Navy's Bureau of Aeronautics, the agency where he has been employed from that time to the present.

We in the A.S.M. know him best as the chairman of our Metals Handbook Committee, past chairman of the committees which prepared the Titanium and Magnesium Supplements to the 1948 Metals Handbook, and through his activities with the Washington Chapter A.S.M. However, during the early days of World War II, he was deeply engaged in the rapid and efficient application of the then NE steels to naval aircraft and in the hectic tasks concerned with production and quality control in the airplanes, engines and equipment needed to win the war, together with the material required to make possible their manufacture. Conservation of strategic alloying elements and rapid solution of the inevitable metallurgical problems encountered in service also took much of his time in those days. The efforts of the Navy, together with the other military services, to achieve maximum standardization brought him into a close working relationship with a series of groups and societies engaged in similar activities, notably A.S.T.M., A.W.S. and the Aeronautical Material Specifications Division of the S.A.E.

His greatest love, except for his wife Evelyn and sons David and Larry, is education and the advancement of knowledge through research and development, and we are sure that it pleases him greatly to see David completing his work this year for the Ph.D. degree at Johns Hopkins University.

At the end of World War II, Mr. Promisel was among the foremost advocates within the government of continued governmental support to advance this nation's metallurgical knowledge and capabilities through research and development.

Through patient, competent and dedicated work within the Navy, working closely with the then new Office of Naval Research and his counterparts in other government agencies, Mr. Promisel was a leader in the task of forging a coordinated and effective national research and development effort in metallurgy. His service on committees and task groups in connection with this effort are legion. Within the government itself, the Research and Development Board, Munitions Board and later the Materials Committee of the Department of Defense, as well as the Materials Advisory Board of the National Research Council, the National Advisory Committee for Aeronautics and its successor, the National Aeronautics and Space Administration, have had the benefit of his service on numerous committees over the years. He is also chairman of the Titanium Research Committee A.I.M.E. and represents the United States on the N.A.T.O. Advisory Group on Aeronautical Research and Development.

In the course of these efforts, Nate Promisel was a prime mover in creation of the Department of Defense Titanium Sheet Rolling Program which, in a thoroughly integrated pattern, including material producers, consumers, government representatives and independent research experts, is achieving a rapid transition of laboratory accomplishments in new titanium alloy developments into production and manufacture of high-performance aeronautical end items. The pace of development work being what it is in these times, Mr. Promisel is already busily engaged in a similar effort in the refractory metals for aircraft and missiles.

In addition to the above and, we suspect, even closer to his personal desires, he has found time to serve on the University of Maryland Advisory Committee on Metallurgy and the Committee on Metallurgical Education A.I.M.E., to lecture at society and university technical meetings and symposia and to maintain an extensive and effective liaison with metallurgical research leaders throughout the world.

In addition to metallurgy, Nate Promisel has published extensively on aeronautical materials, chemistry, electrochemistry, and finishing.

T. F. Kearns

Calumet Members Visit Ford Stamping Plant

Eighty Members of the Calumet Chapter Split Into Two Groups to Visit the Ultra Modern Stamping Plant

of the Ford Motor Co. in Chicago Heights Recently. Members of the two visiting groups are shown above

Cites Factors Affecting Corrosion Of Metals

Wayne Z. Friend (Center), Head, Corrosion Engineering Section, Development and Research Division, International Nickel Co., Is Shown at a Meeting in Saginaw Valley With J. W. Fredrickson (Left), Vice-Chairman, and Lloyd F. Lockwood (Right), Technical Chairman of the Meeting

Speaker: Wayne Z. Friend
International Nickel Co.

Wayne Z. Friend, International Nickel Co., spoke at **Saginaw Valley Chapter** on "Factors Affecting Corrosion of Metals and Alloys". Mr. Friend is in charge of International's Corrosion Engineering Section, Development and Research Division.

Using the chalk board and slides he discussed several types of corrosive attack and methods for overcoming them. In most corrosive solutions involving aqueous environments, the corrosion resistance of metals and alloys is affected largely by the presence or absence of air or oxidizing chemicals in the solution and upon the degree of solubility of the corrosion product films which may be formed at or near the metal surface.

Corrosion tests give data on overall corrosion of materials in inches per year but failures in the field are frequently due to a localized attack with the remainder of the structure still in good condition. Pitting is one form of localized attack. It may occur at breaks in the oxide film on such materials as stainless steel and aluminum, or at breaks in protective corrosion product films on other metals. A potential is set up between the protective film (cathode) and the exposed metal (anode) causing the exposed metal to corrode. Stainless steels and aluminum depend upon an oxide film for protection from attack. A sufficiently oxidizing environment will help heal any breaks that form in the film.

Crevice or concentration cell attack occurs at places like lap joints where concentration of metal ions can occur. In some cases simply a difference in oxygen concentration sets up a galvanic action. A welded joint will afford no crevice for this type of action.

To minimize galvanic corrosion avoid combination of metals that are very far apart in the galvanic series. Also, the smaller the area that is cathodic with respect to the area that is anodic the less the attack will be.

Many cases of corrosion are combated by modification of the alloys used. Intergranular attack at welded areas on stainless steels is well taken care of by use of columbium or titanium stainless steels, or by reduction of carbon content below 0.03% as in the low-carbon stainless steels. Addition of molybdenum to stainless increases its corrosion resistance against sulphuric and acetic acids. Erosion-corrosion resistance of 70-30 cupro-nickel in sea water is improved by including ½% iron in the alloy. Small additions of copper, nickel and chromium to auto body steel has been demonstrated to improve both corrosion resistance and paint adherence.

Sometimes the method of combatting corrosion is to modify the corroding medium. One example cited by Mr. Friend was the deaeration of boiler water to protect boiler tubes. Others were the addition of inhibitors to form a more adherent film and the addition of an oxidizing agent to solutions in contact with stainless steel.

Cathodic protection by means of sacrificial anodes of magnesium or zinc is used on pipe line and boat hull applications. A related method is the application of a current opposite to (and neutralizing) the corrosion current. In this case insoluble anodes are used.

Mr. Friend emphasized that each situation is a case of its own and requires careful analysis. By selection of proper materials, fabrication methods and modification of environment, corrosion problems are being brought under control.—**Reported by LaVern Aurand for Saginaw Valley.**

Outlines Details of Atomic Electrical Power at Utah

Speaker: A. N. Holden
General Electric Co.

"Materials for Nuclear Reactors" was the subject of a talk given by Abe N. Holden, manager, metallurgy and ceramics, Vallecitos Atomic Laboratory, General Electric Co., at a meeting of **Utah Chapter.**

Mr. Holden explained the basic factors involved in building nuclear reactors and how the reactors supply steam to a generator, thus producing electrical power. He explained a typical system of using boiling water and discussed the materials used in each part of the system.

The cost of producing atomic electric energy is not yet but soon will be competitive with gas, oil and coal despite the problems that are being encountered in building a system to function properly. Within the next decade atomic electric power through boiling water reactors should be competitive nearly everywhere.

He compared the progress of designing power plants with that of the development of the automobile. We have had hundreds of different automobiles, and there are presently hundreds of different power plants already conceived, planned or under test. The number of different power plants will diminish as the number of different automobiles has diminished and efficiency will increase as better materials are developed and utilized and we learn how to use some of the materials that have already become standard. Engineers designing steam turbines and equipment to go with some of our present reactors are forced to use designs similar in temperature and pressure to 1926 models because we haven't yet developed nuclear super heaters for use with our reactors. Within the next three or four years, it is likely that nuclear super heaters will be developed and these atomic steam plants may then have the same efficiency as our present power units.

General Electric has spent many millions on facilities and development, Mr. Holden explained. Present nuclear plants are expected to last as long as a conventional-type plant, and fuel elements for present plants are designed to last about 2½ to 3 years before requiring replacement. —**Reported by LaMar D. Scott for Utah Chapter.**

Zirconium Described at Toledo

Otto Zmeskal, Dean of Engineering, University of Toledo, Discussed "Zirconium" at a Toledo Meeting. Shown are, from left: R. H. Myers, chairman; J. R. DeJarnett, technical chairman of the meeting; and Dr. Zmeskal

Speaker: Otto Zmeskal
University of Toledo

Otto Zmeskal, dean of engineering, University of Toledo, presented a lecture on "Zirconium" at a meeting of the **Toledo Chapter.**

Dr. Zmeskal outlined the commercial development of zirconium from its beginnings as a laboratory curiosity to its present position in our atomic-age economy. He traced the advances in production techniques which made it possible to reduce the cost from $630 per lb. in 1940 to $7.50 per lb. in 1958. He stated that production capacity had increased during this 10-year period from 0.08 lb. to 3,525,000 lb. Current production techniques, as typified by operations at the Carborundum plant in Akron and New York and at the Mallory-Sharon plant in Niles, Ohio, were described.

Dr. Zmeskal discussed the important properties of the Zircalloy series of alloys and stressed the superior corrosion resistance of the zirconium-columbium alloys when subjected to nuclear radiation. He cited several examples of commercial use outside the atomic energy field where the outstanding corrosion resistance of zirconium to chlorides provided the impetus for new applications.

Rapid oxidation at temperatures above 600° C., plus susceptibility to hydrogen embrittlement, make it necessary to consider the total environment when specifying zirconium for use.—**Reported by H. T. Anderson for Toledo.**

Outlines Methods for Solving Problems

H. R. Clauser, Editor, Materials in Design Engineering *Spoke on the Subject "Thinking and Problem Solving for Engineers" at a Meeting Held by Northwestern Pennsylvania Chapter. Shown, from left: W. Titsler, program chairman; Mr. Clauser; and William W. Lynch, Jr., chairman*

Speaker: H. R. Clauser
Materials in Design Engineering

"Thinking and Problem Solving for Engineers" was the topic discussed by H. R. Clauser, editor, *Materials in Design Engineering,* at a meeting of **Northwestern Pennsylvania.**

Mr. Clauser stressed the need for a systematic approach to problem solving, whether it is a simple, everyday problem or a complex and technical problem. The basic elements in scientific problem solving are diagnosis, preparation, hypothesis, evaluation and decision. Diagnosis involves recognition, definition and analysis of the problem, while preparation includes fact gathering and examination of assumptions.

Hypotheses can be developed either by formal postulation or creative thinking. Recent developments in creative-thinking processes have been check lists, attribute listings, input-output study, forced relationships, the Gordon (or single radical idea) technique and brainstorming. Evaluation is accomplished by experiment, fact verification or mathematical techniques. The final step, decision or problem solution, often is clearly indicated following evaluation.

After Mr. Clauser's talk a sample problem was solved by "brainstorming".—**Reported by C. W. Lindquist for Northwestern Pennsylvania.**

IMPORTANT MEETINGS
for April

Apr. 5-10—Instrument Society of America: Nuclear Congress, Cleveland, Ohio. Richard Rimbach, secretary, I.S.A., 845 Ridge Ave., Pittsburgh 12.

Apr. 6-10—American Welding Society: Annual Meeting and Welding Show, Hotel Sherman, Chicago. Arthur L. Phillips, Secretary, A.W.S., 33 W. 39th St., New York 18.

Apr. 6-10—American Institute of Mining, Metallurgical, and Petroleum Engineers: Annual Conference, Sheraton-Jefferson Hotel, St. Louis. Ernest Kirkendall, Secretary, A.S.M.E., 20 W. 39th St., New York 18.

Apr. 13-17—American Foundrymen's Society: 63rd Castings Congress, Hotel Sherman, Chicago. William W. Maloney, Secretary-Treasurer, A.F.S., Golf & Wolf Rd., Des Plaines, Ill.

Apr. 18-22—American Society of Tool Engineers: Annual Meeting, Hotel Schroeder, Milwaukee. Harry E. Conrad, Executive Secretary, A.S.T.E., 10700 Puritan Ave., Detroit 2.

Apr. 21-23—American Society of Lubrication Engineers: Annual Meeting, Hotel Statler, Buffalo. W. F. Leonard, Secretary-Treasurer, A.S.L.E., East Randolph St., Chicago 1.

Apr. 22-26—Metal Treating Institute: Annual Spring Meeting, Hollywood, Fla. C. E. Harington, Executive Secretary, M.T.I., 271 North Ave., New Rochelle, N. Y.

Apr. 25-30 — Scientific Apparatus Makers Association: Annual Meeting, The Greenbrier, White Suphur Springs, W. Va. Kenneth Anderson, Executive Vice-President, S.A.M.A., 20 N. Wacker Dr., Chicago 6.

ROBERT (Bob) J. PERRY was appointed sales engineer in the Pittsburgh territory by Surface Combustion Corp.

♦ ♦ ♦

Metals and Residues, Inc., has announced that ROBERT BILANGI has been named sales manager, ARTHUR FRIEDMAN, formerly assistant to the treasurer, is now controller and will continue as purchasing agent for raw materials, BERNARD H. DAVIDSON, formerly chief chemist, takes over the newly created post of technical director, and LEO D. SUPIRO, treasurer, will devote his time exclusively to research and management.

♦ ♦ ♦

DWIGHT A. WRIGLEY has been appointed assistant general manager at Riverside Alloy Metal Division, H. K. Porter Co., Inc., to fill the vacancy left when J. C. HYDRICK was transferred to head Porter's Disston Div.

♦ ♦ ♦

The stockholders of Pangborn Corp., Hagerstown, Md., have elected RALPH M. TRENT president, and ROBERT H. MCCAULEY director, to fill the unexpired term of Victor F. Stine, recently deceased.

♦ ♦ ♦

ARTHUR C. OLSEN, formerly with the Utica Division of Curtiss-Wright Corp., is now plant controller of Universal-Cyclops Steel Corp.'s Bridgeville plant.

♦ ♦ ♦

G. B. COOPER, former senior research engineer in the Research and Development Dept., has been made research supervisor for Jones & Laughlin Steel Corp.

♦ ♦ ♦

JAMES H. SANDS, executive vice-president of Eclipse Fuel Engineering Co., is on a six-months tour of duty as advisor to the director of the Metalworking Equipment Div. Business and Defense Services Administration, U. S. Dept. of Commerce.

♦ ♦ ♦

After an intensive eight-week training course J. D. RODGERS and R. A. NEDERMAN have been named technical service representatives of Oakite Products, Inc. in Houston and Kansas City, respectively.

Reviews Developments in Metallography

Shown at a Meeting at Rhode Island Are, From Left: David A. Thomas, Massachusetts Institute of Technology, Who Spoke on "New Developments in Metallography"; Chandler Lawrence, Coffee Speaker; Clifford E. Ey, Chairman; G. Schubert, Secretary-Treasurer; and M. C. Battey, Vice-Chairman

Speaker: D. A. Thomas

Massachusetts Institute of Technology

Members of the **Rhode Island Chapter** heard a talk on "New Developments in Metallography" by David A. Thomas, assistant professor of metallurgy, Massachusetts Institute of Technology.

Metallography is the observation and interpretation of the structure of metals. Several techniques used are quantitive metallography, electron microscopy, electron probe microanalysis and electron transmission microscopy.

Quantitive metallography enables the observer to determine the volumes of various constituents. The actual identification of each constituent must be interpreted by the observer through analysis of results learned from several testing techniques. The use of other techniques, such as X-ray diffraction, spectrographic analysis, etc., assist in photomicrographic interpretation.

One of the interesting uses of conventional metallography is the study of dislocations. Etching fluid which attacks the areas of dislocations can show the pattern of these dislocations. Electropolishing is sometimes used, with and without etching fluids.

The electron microscope, with its ability to magnify many times more than the light microscope, has made possible new observations. One interesting fact in the use of the electron microscope is that the actual specimen is not observed. The specimen is etched and polished, then a thin plastic coating is applied to the surface to be investigated. When this plastic coating is removed, it is a relief map of the specimen surface. The electron microscope observes this plastic relief map and transmits its pattern to a photomicrograph.

Electron probe microanalysis is another technique in use. A beam of electrons is focused on a specimen, causing X-rays to be emitted from a very small volume of the specimen. A chemical analysis can be made by measuring these emitted X-rays. The wave length of the X-rays identifies the material and the intensity determines the concentration of that material.

Another new development is electron transmission microscopy. This use of the electron microscope is observation of the actual test specimen. However, the metallic specimen must be very thin, on the order of 100 to 1000 angstroms thick. The electron beam penetrates the specimen, the same as it does the plastic relief map mentioned above. Whereas the electrons passing through the plastic relief map change their intensities because of the thick and thin contour, this is not true of the electron transmission technique. Electrons passing through the specimen have their intensity reduced by their absorption or diffraction when striking the various constituents in the specimen. This intensity pattern of the electrons passing through either the plastic relief map or the thin specimen is recorded on a photographic plate.

Dr. Thomas pointed out that interpretation is of fundamental importance and that no single technique is conclusive. Many tools are available to assist in metallographic analysis and each should be used when necessary for the best interpretation.—**Reported by M. C. Battey for Rhode Island Chapter.**

JOHN F. PETERSON, former sectional sales engineer at Syracuse, is now branch manager of the Newark office of the Bristol Co.

♦ ♦ ♦

Arcos Corp., Philadelphia, has announced two changes in their sales department. ALFRED (Pete) PROVENCHAR, formerly New England district manager, has been appointed manager in Chicago, and CARL GAGE takes over as manager in New England.

Secondary Hardening Cincinnati Topic

Shown at a Meeting of Cincinnati Chapter Are, From Left: Fred Robertshaw, Chairman; Willis Gradison; A. C. Nehrenberg, Who Spoke on "Secondary Hardening in Hot Work and High-Speed Steels"; and Al Pfetzing, Vice-Chairman. Mr. Nehrenberg is with Crucible Steel Co. of America

Speaker: A. E. Nehrenberg
Crucible Steel Co. of America

A. E. Nehrenberg, Crucible Steel Co. of America, presented a talk on "Secondary Hardening in Hot Work and High-Speed Steels" at a meeting of the **Cincinnati Chapter.**

A phenomenon known as secondary hardening enables a high-speed or hot work steel to retain its hardness at red heat. Years ago this phenomenon was thought to be the result of retained austenite but this since has been disproved. The modern-day theory advocates that at elevated temperatures alloy carbides form in high-speed steels, resulting in an increase in hardness with increasing tempering temperatures in the 650 to 1050° F. range.

An M-2 type steel, which is typical secondary hardening steel when annealed, contains approximately 23% carbides in ferrite by volume. These carbides consist of approximately 8½% chromium carbide, 13% molybdenum-tungsten carbide and 1½% vanadium carbide.

When heating an M-2 steel to the austenitizing temperature, chromium carbide is the first to dissolve on heating to approximately 2000° F. Chromium is probably the major contributor to high hardenability. The complex molybdenum and tungsten carbides begin to dissolve on heating above about 1900° F. At 2250° F. about 5% remain undissolved. The last carbides to dissolve are the vanadium carbides, which also play a part, as do molybdenum and tungsten carbide, in secondary hardening.

The tempering operation in carbon steels can be divided into four stages during which structural changes are taking place, as follows:

1. On the initial heating up to 400° F., epsilon carbide and 0.25% C martensite are present.
2. 350 to 700° F. transformation of retained austenite.
3. 400 to 800° F. formation of cementite from epsilon carbide and 0.25% C martensite.
4. Above 700° F. formation of alloy carbides from cementite and alloys in tempered martensite.

The magnitude of the hardness obtained by tempering in the secondary hardening region depends on the type, volume and degree of dispersion of the alloy carbide formed.

Using these concepts of secondary hardening, Mr. Nehrenberg described briefly how they were used in developing a new high-temperature bearing steel having unusually high attainable hardness on tempering and possessing exceptional resistance to softening on prolonged heating at elevated temperatures.—**Reported by Andrew S. Bartish for Cincinnati.**

Metallic Coatings Are Topic At Muncie Chapter Meeting

Speaker: C. L. Faust
Battelle Memorial Institute

Charles L. Faust, supervisor, Electrochemical Engineering Division, Battelle Memorial Institute, spoke at a meeting of the **Muncie Chapter** on "Metallic Coatings". He approached the subject from the standpoint of surface metallurgy rather than electrochemistry.

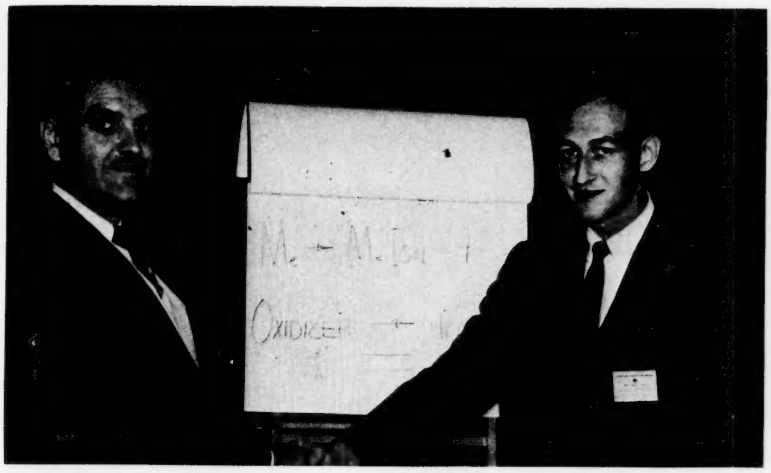
Dr. Faust first reviewed the surface properties that are obtained by metallic coatings, methods of preparing the surface and methods of applying the coatings. He used slides extensively in discussing the three components of metals as related to metallic coatings: the bulk, the surface and the coating. He also illustrated the general features of coatings and different surface preparations. He concluded with a summary of the importance of surface cleanliness. A lively question and answer period followed the technical discourse.

A movie from the U. S. Atomic Energy Commission, entitled "Engineering for Radioisotopes", was also shown.—**Reported by J. A. Buxton for Muncie Chapter.**

Past Chairmen Honored by Cincinnati Chapter

Past Chairmen of the Cincinnati Chapter Recently Gathered for a Meeting. They included, back row, from left: W. Maddox, A. Hartley, W. Whalen, C. H. Lorig, A. E. Focke, T. Waltz, K. Siems, W. Archea, F. Westermann, R. Hoffman, M. LaBau and J. Kahles. Front, from left, are: E. Stenger, G. Reisenberg, O. Williams and S. Olinger. Dr. Lorig was the guest speaker at this meeting. (Reported by R. Bockstiegel)

Outlines Methods Of Combatting Corrosion



J. L. Shutek, Chairman of the New Orleans Chapter, Is Shown (Right), Congratulating C. J. Welcker, Welcker Engineering And Assoc., on the Talk Which He Gave on "Present-Day Methods of Combatting Corrosion"

Speaker: C. J. Welcker
Welcker Engineering and Assoc.

Members and guests of the **New Orleans Chapter** heard Clyde J. Welcker, licensed chemical and metallurgical engineer, Welcker Engineering and Assoc., speak on the "Present-Day Methods of Combatting Corrosion".

The first part of the talk concerned the basic chemical principles involved in the corrosion process, followed by methods and practices of control in the light of theory. Corrosion was defined as a chemical reaction involving a metal and an oxidizer. The end product or products of this reaction were shown to be the materials commonly referred to as rust, oxides, patina, etc., when specific metals were the reactants.

The basic chemical reaction was shown to be the sum of two reactions involving the metal and the oxidizer separately. Conversion of the metal to the ionic or dissociated states was demonstrated as the anode reaction which occurs on the metal reactant surface active in disintegration.

The reaction involving the oxidizer was shown to be the cathode reaction occurring on a surface in electrical contact with the anode but not undergoing disintegration. The cathode area was shown to be a collecting surface or warehouse for the oxidizer which does not undergo any chemical or physical changes.

Basic kinetics and thermodynamics were covered to give some understanding as to why present-day methods of combatting corrosion are the practical application of known procedures used in slowing down any chemical reaction. These methods include: the selection of a metal or alloy at a lower energy level to reduce the driving force for the corrosion reaction; altering the surface to a less reactive state; and reducing the area of the anode.

In regards to the oxidizer reactant, Mr. Welcker pointed out that any reduction in oxidizing agent will reduce the over-all amount of corrosion. Mechanical deaeration, chemical oxygen scavengers and neutralization of acids were mentioned as means of combatting corrosion.

Control of the type of corrosion products can reduce over-all corrosion. Corrosion products which form adhering and blanketing films on anode and cathode areas to reduce corrosion were demonstrated. The control of the corrosion products with regard to the oxidation of iron to the ferric state was explained as the means of passivating or making iron and iron alloys behave more nobly. The use of chromates and chelating materials was explained in light of the ability of iron to corrode to the ferric state.

The ability of paint, plastic and ceramic coatings to decrease the exposure of possible anode and cathode areas, and their function as a hold to increase the resistance of the cathode and anode interfaces with the environment comprising the electrolyte of the galvanic cell involved in the corrosion process were discussed.

Physical methods of insulating metal parts from each other to act as the anode and cathode respectively were described as a means of preventing the corrosion or of increasing the resistance of the metal current path of the galvanic cell, thus reducing the current flow. Any reduction in current of a galvanic cell was shown to be a reduction in the over-all corrosion. The use of materials to increase the resistance of the electrolyte path was demonstrated as a means to reduce corrosion.

The question and answer period dealt with specific facets of cathodic protection, the use of paints, control of grain size of metal, stress relieving and pickling of stainless steel with regards to the corrosion process.

Mr. Welcker stressed that each corrosion problem should be clearly analyzed as to what is reacting, where the reactions are occurring and how control can best be achieved in light of the methods, materials available and economics.—**Reported by F. O. Ransom for New Orleans.**

Stresses Quality Control in Aircraft Engine Manufacture

Speaker: B. L. Taft
Pratt & Whitney Aircraft

Barrett L. Taft, materials engineer, Pratt & Whitney Aircraft, Florida Research & Development Center, described "Various Phases of Metallurgical Quality Control Applied to Aircraft Engines" at a meeting of **Hartford Chapter.**

Some 2500 parts of 100 materials must have adequate metallurgical quality to insure perfect performance of jet engines now starting to be used in commercial aviation. Design and function, source, processing and economics determine the kind and amount of testing to be done. A turbine bucket, for example, is critical and must be tightly controlled for chemistry, stress rupture, heat treating, etc., while with a shipping bracket of carbon steel angle iron, little or no inspection is required.

Tests are made for dimensions such as thickness of sheet, "quality" as revealed by visual inspection, macro-etch, radiography, magnetic particle inspection, etc., composition, physical properties, such as hardness, strength at room temperature, elevated temperature stress rupture and creep, and metallurgical properties such as hardenability and grain size. Special properties checked for include forgeability, machinability, weldability embrittlement, resistance to humidity and grain flow in forgings. Mr. Taft emphasized the importance of visual examination in determining the quality of material.—**Reported by H. Hubbell for Hartford.**

Metallurgical News and Developments

A Department of *Metals Review*, published by the American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio

Devoted to News in the Metals Field of Special Interest to Students and Others

Research Meetings—The Gordon Research Conferences for 1959 will be held from June 15 to Sept. 4 at Colby Junior College, New London, N. H., New Hampton School, New Hampton, N. H., and Kimball Union Academy, Meridan, N. H. Subjects to be covered are Solid State Studies in Ceramics and Physical Metallurgy. Information from: W. George Parks, Director, Dept. of Chemistry, University of Rhode Island, Kingston.

New Laboratory—Battelle Memorial Institute has announced plans for a new laboratory designed especially for studies of plutonium. It is to be erected at Battelle's Nuclear Research Center and is scheduled to be in operation by midsummer.

New Product — Alloyd Research Corp., Watertown, Mass., announces a new series of standards for use in the analysis of nickel, chromium and manganese in 400 series stainless steels.

New Quarters—Welduction Corp. has moved to new larger quarters in Detroit. (19400 W. Eight Mile Rd.) All are cordially invited to inspect the new facilities.

New Corporation—Establishment of the Storchheim Research & Development Corp., Woodside, N. Y., has been announced by Samuel Storchheim, president. The firm will specialize in the development of new metallurgical materials, processes and products. Heavy emphasis will be placed on powder metallurgical techniques, including tailored powder fabrication, powder rolling and explosive compacting.

Translation—Arthur M. Shrager, author of the book "Elementary Metallography and Metallurgy" announces the translation of his book into Japanese.

New Process—A process for the production of molybdenum metal powder by a rapid, single-stage reduction of molybdenum oxide at high temperatures has been announced by Metals & Residues, Inc. Inventor of this process is Lester D. Supiro of East Orange, N. J.

Summer Courses Will Be Held at the Following Universities:

Seminar on Atomic Mechanisms of Fracture	Apr. 12 to Apr. 14	National Academy of Sciences Cambridge, Mass.
Use of Nuclear Reactors and Radioisotopes	June 1 to June 26	Pennsylvania State University University Park, Pa.
Metal Cutting Research	June 7 to June 12	Pennsylvania State University University Park, Pa.
Guided Missile Design	June 7 to June 19	Pennsylvania State University University Park, Pa.
Quality Control by Statistical Methods	June 9 to June 19	Purdue University, Lafayette, Ind.
Sintering and Related Phenomena	June 15 to June 17	University of Notre Dame Notre Dame, Ind.
Industrial Photoelasticity	June 16 to June 20	Massachusetts Institute of Technology Cambridge, Mass.
Bearing Technology	June 16 to June 26	Massachusetts Institute of Technology Cambridge, Mass.
Heat Transfer in the Foundry	June 22 to June 26	Columbia University New York 27, N. Y.
Nuclear Energy	June 22 to Aug. 14	North Carolina State College Raleigh, N. C.
Nuclear Energy	June 22 to Aug. 14	Cornell University Ithaca, N. Y.
Reactor Operation and Design	June 22 to Aug. 14	University of Michigan Ann Arbor, Mich.
Specialized Nuclear Studies	June 22 to Aug. 14	Argonne National Laboratory Lemont, Ill.
Nuclear Energy (Technical Institute Teachers)	June 29 to Aug. 7	Pennsylvania State University University Park, Pa.
Modern Industrial Spectrography	July 20 to July 31	Boston College Cambridge 39, Mass.
Modern Industrial Spectroscopy	Aug. 17 to Aug. 28	Arizona State University Tempe, Arizona
Industrial Nuclear Technology Conference	Sept. 22 to Sept. 24	Illinois Institute of Technology Chicago 16, Ill.
International Symposium on High-Temperature Technology	Oct. 6 to Oct. 9	Asikomar Conference Grounds California's Monterey Peninsula

Outlines Stainless Trends

J. B. Burk, Atlas Steels Ltd., Covered "Trends in Stainless Steels" at a Meeting of Ontario Chapter. He is shown before a display board illustrating some of the typical applications of stainless steels

Speaker: John B. Burk

Atlas Steels Ltd.

J. B. Burk, product manager, Atlas Steels Ltd., talked on "Trends in Stainless Steels" at **Ontario.**

Mr. Burk covered the advantages to be gained in using stainless steels, namely, excellent strength, eye appeal, corrosion resistance, resistance to oxidation, scaling, deformation at elevated temperature and easy cleanability. He indicated that stainless steels, more than any other commercial metal, have shown the least change in price over the past 30 years. An example of a 1928 Canadian price list was very similar to a present-day price list. The use of stainless steels has more than doubled in Canada in the past ten years and it is expected that this trend should continue, if not increase, in the next decade.

Specific fields of application were described, with colored illustrations showing typical uses of this material.

Automotive: The average car carries 22 lb. of stainless, primarily as decorative trim, which represents 16% of the total production of stainless steels. It is expected that this percentage will increase with stainless being used for various engine parts as well as mufflers and tailpipes. Stainless for panel trucks and for acid and milk carriers is already in large-scale use and should continue to grow.

Aircraft and Missiles: The jet engines now use many varieties of the stainless and related superalloys. Airframe parts and honeycomb sections in delta wing construction are examples of where stainless is playing an important part. Precipitation hardening grades and their wide sheets represent two recent developments that will increase the further use of stainless grades in aircraft construction. The warhead and protective skin on missiles, as well as many of the delicate instruments and launching platforms, utilize various grades of stainless steels.

Architecture: Several monumental buildings in both the U. S. and Canada have used stainless steel outer paneling in their construction. This is one of the most important phases in the growing use of these steels and will soon be of practical use in the medium-priced building field. This has been brought about by the following:

Economy: The new pre-formed panelled sections are of somewhat higher cost than brick and masonry but give the advantage of more rapid erection, space saving, better insulation and low maintenance cost.

Eye Appeal: Textured, embossed and brushed finishes are now available to provide design contrast. Enamelling and use of special coatings (e.g., Permyron), help break the monotony of a solid metallic color. Stainless has started to find its way into the construction of many mill buildings, warehouses, office buildings, hospitals and schools.

Petroleum: Bubbles, caps and trays in fractionating towers, as well as heat exchanger tubes, represent an important field.

Textiles: The resistance to corrosion attack from special dyes and resistance to color pick-up are advantageous properties of stainless.

Food Processing: Stainless will not impart any taste to food, is completely sanitary and safe and possesses optimum cleanability. In this respect, recent tests have shown three finishes of stainless to be better than glass for cleanability.

Pulp and Paper: Digestors, filters, etc., must be made of Types 316 or 317 to withstand the severity of corrosion in this field.

Domestic and Appliance Uses: Washing machine tubs, stove trim, pots and pans, kitchen sinks, flatware, kick plates, electric switch plates and window trim are just some of the many examples where stainless is finding its way into our homes. It was pointed out that there are more stainless kitchen sinks used in Canada than in the U. S. on a per capita basis. Clad stainless has also become of major importance to the manufacture of pots and pans to provide an optimum combination of stainlessness and heat conductivity.

Atomic Energy: The nonmagnetic and thermal shielding properties of some stainless grades have proven to be required in atomic power reactors. Large amounts of stainless were also used in the U. S. atomic submarine *Nautilus*, from the power reactor to the galley.—**Reported by B. M. Hamilton for Ontario.**

Gives Talk on Gas Turbines

Donald J. Henry (Right), Assistant Head of the Metallurgical Engineering Dept., General Motors Research Staff, Who Spoke on the "Gas Turbine" at Syracuse, Is Shown Being Congratulated by H. C. Holbert, chairman

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Syracuse Briefed on Cermets, Carbides and Intermetallics

Speaker: M. F. Judkins

Firth Sterling, Inc.

Malcolm F. Judkins, director, new products development, Firth Sterling, Inc., spoke at **Syracuse** on "Carbides, Borides, Cermets and Intermetallics".

Mr. Judkins discussed the high-temperature problems encountered because of aerodynamic heating on leading edges and nose cones. Metals are used to 1750° F. but above these temperatures other materials have to be utilized.

Ceramics, which are neither metal nor plastic, are used. Even though, by themselves they are brittle, they retain their strength at high temperatures and can be sprayed onto a more ductile base. The majority of ceramics are composed of carbides or borides.

Cermets, which are a combination of ceramics and metals, were used to attain higher temperatures in turbines. These materials could not resist impacts and therefore were never used in a flying engine.

Mr. Judkins explained the methods and materials used to absorb or dissipate the heat encountered in reentry.—**Reported by G. Trojanowski for Syracuse Chapter.**

Talks on What's New in Abrasives

E. S. Cramer, Norton Co., Gave a Talk Entitled "What's New in Abrasives" at a Meeting of Northwestern Pennsylvania Chapter. Shown are, from left: Mr. Cramer; R. Hotaling, technical chairman of the meeting; W. W. Lynch, Jr., Chapter chairman; and I. Marsteller, vice-chairman

Speaker: E. S. Cramer
Norton Co.

Edward S. Cramer, abrasive engineer, Norton Co., gave a talk entitled "What's New in Abrasives" at a meeting held by the **Northwestern Pennsylvania Chapter.**

Mr. Cramer described how grinding wheels are made and some of the improvements made in recent years in their manufacture. The most common abrasives used in grinding wheels are aluminum oxide, silicon carbide and diamond; with shellac, rubber, resin, clay and silicate of soda as bonding materials. Over 150,000 different combinations of grain, grade, type and structure are available in sizes ranging from 0.040 in. in diameter to 6 ft. in diameter. Because of this great variety, grinding wheels are not mass produced.

In making vitrified wheels the abrasive and bonding materials are mixed in a power mixer. The wheels are then molded in a hydraulic press. After molding, the wheels are shaved and heat treated in kilns where temperature control must be very accurate. Electric kilns have recently been developed which greatly reduce the time required for firing. Following heat treatment the wheels are trued to exact dimensions and checked for proper hardness, truth and balance. To insure safety in operation, wheels are speed tested at speeds 1½ times greater than the recommended operating speeds.

The grinding wheel industry is striving to improve the quality of its products. The use of man-made diamonds is increasing in importance. Man-made diamond wheels give over 35% longer life than natural diamonds. Reinforced grinding wheels, which are almost unbreakable, are another new development resulting in improved wheel life and safety.

Mr. Cramer also directed attention to the numerous pamphlets and handbooks which are easily available from the grinding wheel industry to assist customers in solving specific grinding problems.—**Reported by R. W. Henderson for the Northwestern Pennsylvania Chapter.**

Explains Effects of Aging Heat Treatment on Corrosion Resistance

Speaker: M. A. Scheil
A. O. Smith Corp.

Merrill A. Scheil, director of metal research, A. O. Smith Corp., and A.S.M. trustee, spoke at the National Officers' Night meeting at **Albuquerque.** Mr. Scheil gave a talk on the current accomplishments as well as the plans and need for continued growth of A.S.M. He covered the new A.S.M. headquarters building, the Metals Handbook, accomplishments in the field of education, and technical services of the A.S.M. to the metals industry.

Mr. Scheil's technical topic was the "Effect of Aging Heat-Treatments on the Corrosion Resistance of Some Austenitic Stainless Steels". With the present improvements in 18-8 stainless steels, such as carbide stabilizer additions and lower carbon content to 0.03% maximum, it is now possible to fabricate articles easily without greatly upsetting the material's original intergranular corrosion resistance. The effect of time and temperature on the corrosion resistance of these stainless steels has not been too well explored. Mr. Scheil explained the effect of aging Types 347, 304L and 316L for different times at different temperatures on the corrosion resistance of these materials as determined by a standard test. He noted that the boiling nitric acid, or Huey Test, is used to determine corrosion resistance of these test materials because it reveals sensitization of metal when chromium carbide and the sigma phase are precipitated at the grain boundaries. The temperature range was from 700 to 1500° F. and the time involved was up to 10,000 hr.

In general, the effect of the time-temperature relationship for Type 347 showed a high corrosion rate after 1000 hr. at 900° F. and after 100 hr. at 1000° F. The corrosion rate rapidly decreased between 3500 and 10,000 hr. at 1000° F. The general effect of the same aging tests on the 304L showed high corrosion rate between 350 and 1000 hr. at 900° F. and between 35 and 100 hr. at 1000° F. The corrosion rate of 316L was quite high in the 1200 and 1300° F. range but quite low up to 10,000 hr. at 900° F. and up to 350 hr. at 1000° F. The foregoing is an extreme simplification of the large amount of data generated in these tests. Mr. Scheil elaborated on how this data was organized by taking the time-temperature relationship at any particular corrosion rate level and constructing a graph showing the contours of various corrosion levels as a function of time and temperature. This data was in a form then for each of the three types tested in which the limitations of the time-temperature relationship for a particular corrosion level could easily be seen. Further testing after a stabilization heat treatment of 1650° F. for 2 hr. showed a marked improvement of corrosion resistance for Type 347, but had no beneficial effect on Types 304L and 316L.

Mr. Scheil concluded by emphasizing that the data from this investigation had resulted in the development of time-temperature-sensitization diagrams that were distinctly different for each type of material. If further work reveals that these patterns persist it will be possible to characterize each type of stainless steel by using these diagrams.—**Reported by G. J. Hof for Albuquerque.**

Points Up Position of Engineer in Modern Society

Speaker: Hiram Brown
Solar Aircraft Co.

Hiram Brown, technical advisor, Des Moines plant manager of Solar Aircraft Co., spoke at a meeting of the **Syracuse Chapter** on "The Engineer in Modern Society".

Mr. Brown pointed out that an engineer must be a potential source of advancement to technological or managerial responsibility. He must have ability to express himself and to transmit ideas logically and concisely.

The complete man must be a blend of art and science. He needs the arts to counteract the narrow effects of specialization. The engineer can not ignore society today, but should become more active in it and therefore should be exposed and made aware of cultural education.

The best way to counteract the effects of specialization is for the educational institutions to broaden their field of study and increase their cultural curriculum. This should be done even if the time spent at school has to be increased.—**Reported by G. Trojanowski for Syracuse.**

Obituaries

FRANK F. POLAND, assistant director of research, Rome Div., Revere Copper & Brass Inc., died on Nov. 16 in Easton, Md., at the age of 63. Mr. Poland was an active member of the Mohawk Valley Chapter.

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THEODORE KAUFFMANN, SR., chairman of board of directors, S. Obermayer Co., and Ramtite Co., died Jan. 14 at the age of 92. Mr. Kauffmann was considered the dean of the foundry supply industry, which he had served for over 60 years.

♦ ♦ ♦

RUBEN O. PETERSON, pioneer in the field of power brush engineering and a vice-president of Osborn Manufacturing Co., died Dec. 28 in Cleveland at the age of 59.

♦ ♦ ♦

HOWARD C. ARNOLD, member of Pittsburgh Chapter, died Sept. 27 in Pittsburgh. He was associated with the Federal Enameling & Stamping Co. until his retirement in 1958.

♦ ♦ ♦

CHARLES S. REDDING, 75, chairman of the board of directors and former president of Leeds & Northrup Co., died Jan. 2 after a brief illness.

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JESSE ANTHONY KINGSBURY, retired head of the Materials Engineering Branch, U. S. Naval Gun Factory, Washington, D. C., died in Annandale, Va., at the age of 70. He was a widely known and highly respected long-time member of the Washington Chapter.

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ROBERT B. GANLEY, vice-president and general manager of the Syracuse Heat Treating Corp., died unexpectedly in November at the age of 44. Mr. Ganley was a member of the Syracuse Chapter.

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HENNING KLOUMAN, special assistant and metallurgical consultant to the general manager of Bendix Aviation Corp., died unexpectedly at the age of 68. He was formerly vice-president and director of Michiana Products Corp.

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ALFRED WILLIAM HALL, member of Rocky Mountain Chapter, died in December.

Ladies Meet in Chattanooga

At the annual ladies night meeting held by the Chattanooga Chapter, John Kruse of Combustion Engineering, Inc., presented color travel slides. A special dinner and social period rounded out a very successful and entertaining evening.—**Reported by J. H. McMinn for Chattanooga.**

Reviews Space-Age Metals at Peoria

J. Day, Vice-President of Technology, Crucible Steel Co. of America, at a Meeting in Peoria. Shown are, from left: C. S. Black, program chairman; D. J. Wright, technical chairman; Dr. Day; R. H. Hays, chapter chairman; and G. E. Burks, vice-president, Caterpillar Tractor Co.

Speaker: M. J. Day

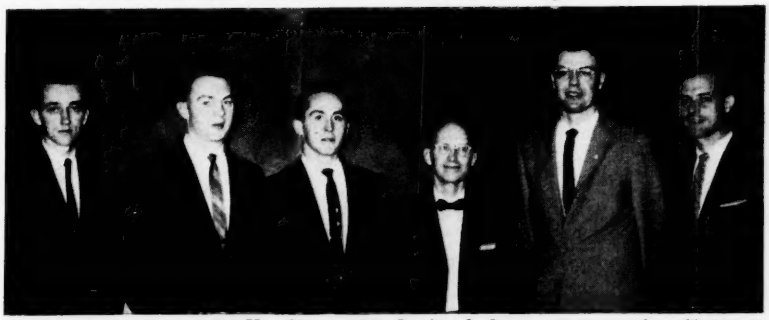
Crucible Steel Co. of America

Maurice J. Day, vice-president of technology, Crucible Steel Co. of America, spoke on "High Performance Alloys for the Space Age" at a meeting in **Peoria.**

Dr. Day discussed some of the developments related to high-strength alloy steels and toolsteels. Super alloys and titanium alloys with their engineering applications in the design of missiles and aircraft were included. Also mentioned was the place of titanium in the metal picture. A "rainbow of materials" was presented indicating where each might be used to best advantage. The discussion was amply filled in with historical background and illustrated with numerous charts of material properties and treatments.

In conclusion, Dr. Day pointed out that no one individual material is the best for present-day engineering requirements.—**Reported by W. M. Hallett for Peoria.**

Aborn at Missouri School of Mines



National Treasurer R. H. Aborn, U. S. Steel Corp., Presented a Talk on "Modern Aspects of Stainless Steels" at National Officer's Night at Missouri School of Mines and Metallurgy Chapter. Shown are, from left: K. Pendleton, treasurer; J. Steele, membership; D. Price, chairman; Dr. Aborn; C. Washburn, vice-chairman; and D. Padberg, publicity

Speaker: R. H. Aborn

U. S. Steel Corp.

The National Officers' Night meeting at the **Missouri School of Mines and Metallurgy Chapter** featured a talk by Robert H. Aborn, U. S. Steel Corp., and national treasurer A.S.M. on the aims and organization of A.S.M. Dr. Aborn touched directly on the particular problems of the student chapter in fostering membership among the many nonmembers frequently attending the meetings. Of special interest were his comments on the work on the new Metals Handbook and the building in Cleveland.

In the technical portion of his talk, Dr. Aborn spoke on "Modern Aspects of Stainless Steels". Several different alloys were considered and compared. The properties of chromium-nickel, chromium-nickel-molybdenum and manganese alloys were discussed at length. The effect of manganese and nitrogen in producing an austenitic steel was also covered. The addition of manganese increases the solubility of nitrogen which in turn stabilizes the austenite and removes the need for nickel.—**Reported by D. J. Padberg for Missouri School of Mines and Metallurgy.**

Meet Your Chapter Chairman

BALTIMORE

WILLIAM H. REDDEN was born in Corsicana, Tex. He joined A.S.M. during his student days at Carnegie Tech. while working for his B.S. degree in metallurgical engineering. After graduation he started in the Looper Training program in Bethlehem, after which he was assigned to the Sparrows Point plant. He was chief observer in the openhearth and blooming mills for a number of years, and in 1956 was appointed assistant chief metallurgist.

Mr. Redden has been active in chapter affairs as chairman of the attendance, finance, entertainment and membership committees and second and first vice-chairman. He is also a member of the Maryland Institute of Metals, Engineers Club and Country Club of Sparrows Point. He serves on the Board of Deacons of the First Presbyterian Church of Baltimore. His recreation is golf and swimming with his two boys.

TEXAS

JOE B. MARX originated in Detroit. His technical education was acquired at Texas Agricultural and Mechanical College. In 1943 he joined the Sheffield Division of Armco Steel Corp., Houston, where he is now chief inspector. Previous chapter service has been as secretary and vice-chairman. He is associate editor of the Slide Rule Magazine, an officer in the Sheffield Technical Society and Lions Club, and a member of the Houston Engineering and Scientific Society and the Engineer's Council of Houston.

Mr. Marx is a veteran of World War II, is married and has a daughter. Interests and hobbies include golf (in the 80's), skeet shooting and membership in the Willow Meadows Civic Club.

WORCESTER

LEONARD L. KRASNOW, assistant factory manager, Lodding Engineering Corp., was born in New York City. He is a graduate of Worcestser Polytechnic Institute, and continued studies, at night, for about nine years, at New York, Northwestern and Clark Universities. His first job after finishing high school was as a machinist. Later he worked as draftsman and designer, chief draftsman, then became assistant chief engineer at Worcester Engineering Co., and chief engineer at Lodding before assuming his present position.

Mr. Krasnow has been granted a number of patents on magnetostriction, automatic screw drivers and automatic clamping devices. A member of A.S.M. for eight years, he has been on the executive committee for five years. He is also on the executive committee of the Society for Advancement of Management.

During World War II he served in the infantry. He has two sons, and his recreational interest is hi-fi.

LEHIGH VALLEY

JOHN F. CLARK has been a member of A.S.M. since 1947. Born in Troy, N. Y., his B.S. degree in metallurgical engineering was obtained at Rensselaer Polytechnic Institute. Upon leaving college he joined Bethlehem as a looper, and is now assistant metallurgical supervisor, inspection, alloy and toolsteel products.

Mr. Clark is past dean of the Penn State, Bethlehem Center, Extension Metallurgy Course. Previous chapter service includes secretary, vice-chairman and member of the executive committee.

He has a daughter, Leslie, 7, and a son, Allen, 5 years old. For fun he bowls and is an avid golfer. He was in the army in World War II.

NEW JERSEY

JOHN L. EVERHART graduated from Lehigh University with a degree in chemical engineering, after which he went to Bethlehem Steel Co. as a chemist analyzing iron, steel and slags. He spent several years at Battelle Memorial Institute and the National Bureau of Standards, where he supervised the collection of information for a book on the properties of metals, published in 1943. He has contributed more than 50 articles to technical magazines and has written a book on "Titanium and Titanium Alloys". All this experience is being put to use on his present job as technical editor of *Materials in Design Engineering*.

An A.S.M.'er for the past 25 years. Mr. Everhart has contributed material on tin to the 1948 edition of the A.S.M. Metals Handbook and is preparing material for the new edition.

Book collecting is Mr. Everhart's hobby, his particular interest being the 18th Century iron industry, and he enjoys bass fishing and golf with his 14 year old son.

EASTERN NEW YORK

JOHN HALL WESTBROOK was born in Troy, N. Y. His B.S. and M.S. degrees in metallurgical engineering were acquired at Rensselaer Polytechnic Institute and a Sc.D. degree in metallurgy from Massachusetts Institute of Technology. At R.P.I. he was president of the Interfraternity Council, managed the varsity swimming team and was a class vice-president.

After several years in the Navy as electrical technician, Jack returned to R.P.I. as research assistant, later went to M.I.T. in the same capacity. He is now research associate at General Electric Co.'s Research Laboratory in Schenectady.

Chapter activities include membership, program and educational committees and vice-chairman. He is active in other professional societies, having been secretary-treasurer and vice-chairman of the Electrochemical Society.

With two boys, Nicholas and Kirkland, and two girls, Kathryn and Melissa, an interest in P.T.A. is inevitable. His particular hobby is state and local history.

J. B. Marx

J. L. Everhart

L. L. Krasnow

J. H. Westbrook

W. H. Redden

Describes Hardness Testing at Kansas City

V. E. Lysaght, Wilson Mechanical Instrument Div., American Chain & Cable Co., Inc., Discussed "Hardness Testing and Measurement" at a Meeting in Kansas City. Shown are, from left: Bill Deterding, vice-chairman; Mr. Lysaght; and C. K. Kenyon, chairman of the Kansas City Chapter

Speaker: V. E. Lysaght
Wilson Mechanical Instrument Div.

Hardness testing, its development through the years from 1900, its importance to the metallurgist and to industry as a whole, was the theme of a talk on "Hardness Testing and Measurement" by Vincent E. Lysaght, general sales manager, Wilson Mechanical Instrument Division, American Chain & Cable Co., Inc., at a meeting of the **Kansas City Chapter.**

Usage and convenience has suggested and brought about an accepted general meaning of the term "hardness testing" as applied to the broad field of metallurgy. It is, to the metallurgist, engineer and the physicist, that resistance of a given material to indentation, compared to resistances offered by other materials. This limited meaning can, therefore, be condensed into an accepted phrase "indentation hardness". The word "hardness" is used alone and the modifying word "indentation" is always implied.

The beginning of the 20th century, with the investigations conducted by J. A. Brinell in Sweden, marked a milestone in the modern concepts of hardness testing. His method, the "ball test", was destined to become one of the most significant developments and perhaps the most important hardness testing procedure for the metallurgist throughout the 1920's, and to share equally in importance with the more advanced techniques of today.

Hardness testing is perhaps one of the most widely used and universally accepted methods of nondestuctive testing. Its popularity can be attributed, in a large measure, to its simplicity, economy and speed. The more commonly used testing instruments for the accurate determination of hardness are the Brinell, Rockwell, Rockwell superficial, 136° Diamond Pyramid, and the Scleroscope units. Through the use of a series of slides, their advantages, limitation and uses were discussed. He also covered critical requirements for the testing of thin sheet metals and cylindrical parts. Emphasis was placed on the special production applications of these precision instruments. Often, it is desirable to convert from one hardness scale, say Brinell, to another, such as the Rockwell or vice-versa. Since no conversion is mathematically correct, it was stressed that conversion should be used with discretion. Conversion tables have been established by testing thick specimens and are only valid for such specimens.

To prevent any distortion of the specimen or harm to the indenter, any workpiece being tested for hardness should be properly supported. This is particularly important for irregular shapes, sheet metal, small items, rounds, etc. A fundamental requirement in such tests is that the surface to be observed be approximately normal to the tester's indenter and that the piece be immobilized as the testing load is applied. The support itself must be of sufficient rigidity to prevent distortion through constant usage.

Fully automatic hardness testers, such as the Rockwell and Brinell, capable of performing up to 1000 tests per hr., also received attention. High-quality, mass-production testing requirements of industry are making these units much sought after.

In conclusion, Mr. Lysaght discussed the various aspects of microhardness testing, a technique that is receiving considerable attention in research and development work and also is being used for production control. These units afford accurate measurement, in restricted observation areas, of carbide tool tips, watch springs, drill rods, etc., and for the measurement of plated surface hardnesses.—**Reported by E. J. Blair for Kansas City.**

Technical Papers Invited for A.S.M. Transactions

The Transactions Committee of the A.S.M. is now receiving technical papers for consideration for publication in the Transactions of the Society and possible presentation before the next national meeting of the Society, to be held in Chicago, Nov. 2 to 6, 1959.

Many of the papers approved by the Committee will be scheduled for presentation on the technical program of the 41st National Metal Congress and Exposition.

Papers may be submitted any time up to Apr. 15, 1959, for consideration for presentation at this convention. The selection of approved papers for the convention technical program will be made in May 1959. Manuscripts may be submitted any time during the year and upon acceptance by the Transactions Committee will be processed immediately for preprinting. All papers accepted will be preprinted and made available to any members of the Society requesting them. However, the printing of an accepted paper does not necessarily infer that it will be presented at the convention. Reprinting of accepted papers is done quarterly; notification of their availability is published in *Metals Review.*

Manuscripts in triplicate, plus one set of unmounted photographs and original tracings, should be sent to the attention of Ray T. Bayless, assistant secretary, American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio.

Should it be your intention to submit a paper, please notify A.S.M. A copy of the booklet entitled "Suggestions to Authors in the Preparation of Technical Papers" will be gladly forwarded. This booklet may help considerably in the preparation of line drawings and illustrations.

Speaks on Spring Materials at Dayton

Robert A. Bell, William D. Gibson Co., Spoke on "Springs and Spring Materials" at a Meeting in Dayton. Shown are, from left: Richard R. Kennedy; C. H. Lorig, national president A.S.M., who gave the coffee talk; Walter J. Ridd, chapter chairman; and the speaker, Mr. Bell

Speaker: R. A. Bell
William D. Gibson Co.

Members of the **Dayton Chapter** took an afternoon tour through the new engineering research building of National Cash Register Co., and then assembled for the dinner meeting which was followed by a special coffee talk by the National President C. H. Lorig.

Robert A. Bell, assistant chief engineer, William D. Gibson Co., spoke on "Springs and Spring Materials". He defined a spring as a means of storing energy and releasing it in a specified direction to do useful work. All materials have spring properties but commercial springs are metal, and the cheapest material today is hard drawn steel wire. Stainless steel, beryllium-copper, brass and bronze are also used for applications in corrosive atmospheres.

Music wire, which is one of the best room-temperature materials, drops off in properties rapidly with rather small increases of temperature. This is because of the very heavy cold work induced during drawing. For high-temperature applications, very high nickel, chromium and cobalt alloy materials are being tested and show the most promise at the present time. These materials work up to 1000° F. provided the springs are designed for low stress levels. Nothing is recommended for use above 1000° F.

Mr. Bell discussed the design of an experimental spring for higher temperature application in which the spring was hollow and had a liquid coolant circulating through it. However, this was considered impractical because of the size of the unit.

Mr. Bell feels that 1000° F. is about the present limit of metallic springs and that designers in the future may have to look at nonmetallic materials for springs that operate at higher temperatures (jet, rocket and atomic applications). — **Reported by D. M. Ashfal for Dayton.**

Plan Ladies Night Meeting in Peoria

Edward A. Kister, Head, Architectural Section, Application and Development Department, Allegheny Ludlum Steel Co., Presented a Talk on "Stainless Steel for Domestic Use" at the Ladies Night Meeting of the Peoria Chapter. Shown above are members of the arrangement committee. Front, from left: Mrs. Lois Casson, Mrs. W. L. Bracken, Mrs. Joseph Oberle, Mrs. D. H. Hawes and Mrs. William Deahl. In back row, from left: William Bevis, W. L. Bracken, Joseph Oberle, David H. Hawes and William Deahl. (Reported by William M. Hallett for Peoria Chapter)

Compliments

To EDGAR C. BAIN, internationally known metallurgist, who was presented the Ambrose Monell Medal of the Columbia University school of Mines for distinguished achievement in mineral technology. Dr. Bain was national president A. S. M. in 1937.

♦ ♦ ♦

To JOHN J. GILMAN, metallurgist for General Electric Co., who was awarded both the Mathewson Gold Medal and the Rossiter W. Raymond Award at the national convention of the American Institute of Mining, Metallurgical, and Petroleum Engineers in February. This was the second time Mr. Gilman has received the Rossiter award.

♦ ♦ ♦

To JOHN HAUSER, whose research on tempered alloy martensite in low-alloy steels won him Crucible Steel Co.'s annual John A. Mathews Award for "outstanding technical contribution of the year". Mr. Hauser is staff metallurgist at Crucible's Central Research Laboratory.

♦ ♦ ♦

To HOWES BODFISH, sales technical advisor for Aluminum Co. of America, Philadelphia District, on his retirement in December following 31 years of service with Alcoa. Mr. Bodfish was cited by A. S. M. in 1948 for distinguished service in the dissemination of metallurgical knowledge.

♦ ♦ ♦

To CLYDE WILLIAMS, pioneer in many phases of metallurgy, who was presented the James Douglas Gold Medal of the American Institute of Mining, Metallurgical, and Petroleum Engineers in February. Mr. Williams, former president of Battelle Memorial Institute, is president of Clyde Williams & Co., industrial research and management advisors of Columbus.

♦ ♦ ♦

To PAUL LACOMBE, head of the department of metallurgy and director of the Research Center at the School of Mines in Paris, on his appointment to Republic Steel Corp.'s Chair of Metallurgy at Case Institute of Technology. Dr. Lacombe, the first distinguished professor to occupy the chair, will teach a course in metallurgy at the graduate level.

♦ ♦ ♦

To H. W. LOWNIE, JR., research metallurgist at Battelle Memorial Institute, who will receive the American Foundrymen's Society's John H. Whiting Medal for 1959 for his outstanding contributions to the A. F. S. and to metallurgical progress.

A.S.M. created the Annual Teaching Award in Metallurgy, open to teachers of metallurgy in the United States and Canada. Value $2000.

Nominating Committee for National Officers of A.S.M.

In accordance with the Constitution of the American Society for Metals, President C. H. Lorig has selected a nominating committee for the nomination of president (for one year), vice-president (for one year), treasurer (for two years), and two trustees (for two years each). This committee was selected by President Lorig from the list of candidates submitted by the chapters. The personnel is: Chairman: Charles K. Donoho (Birmingham Chapter), American Cast Iron Pipe Co., P. O. Box 2603, Birmingham 2, Ala.; James G. Parr (Edmonton Chapter), University of Alberta, Dept. of Mining and Metallurgy, Edmonton, Alberta, Canada; Erith T. Clayton (Baltimore Chapter), Tainton Co., 3100 Elm Ave., Baltimore 11, Md.; Edgar W. Husemann (Warren Chapter), Copperweld Steel Co., Warren, Ohio; George H. Balentine, Jr. (Old South Chapter), Precision Machine Works, Inc., Box 535, Greenville, S. C.; William H. Charlesworth (Muncie Chapter), 1131 Webster, New Castle, Ind.; Robert N. Gillmor (Syracuse Chapter), General Electric Co., Electronics Park, Bldg. 3, Syracuse, N. Y.; Albert H. Rauch (Tri-City Chapter), 1815 27th St., Rock Island. Ill.; and John C. McDonald (Santa Clara Valley Chapter), 206 Angela Dr., Los Altos, Calif.

The committee will meet during the third full week in the month of May. It will welcome suggestions for candidates in accordance with the A.S.M. Constitution. Article IX, Section 1(b), which provides that endorsements of a local executive committee shall be confined to members of its local chapter, but individuals of a chapter may suggest to the nominating committee any candidates they would like to have in office.

This year the National Office has prepared a form on which to provide the pertinent information on candidates for the various positions open on the Board of Trustees. Copies of this form, entitled "Candidate for Nomination to Board of Trustees", were sent to the chairmen of each of the local chapters. Individual members and representatives of members of the Society who wish to endorse candidates for consideration are urged to utilize these forms in providing details on their candidates. Extra copies of the form may be obtained by writing Miss Evelyn Gardner, National Office, American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio.

A.S.M. created the Annual Teaching Award in Metallurgy, open to teachers of metallurgy in the United States and Canada. Value $2000.

Preparing for "Spring Planting"

Metals Experts Consider "Spring Planting" Plans for the New A.S.M. Mineral Garden as They Check Two Recent Donations for Radioactivity. The large rock, on the right, is a commercial piece of uranium that activated the Geiger counter. Pictured are, from left: Leslie G. Reardon, building consultant, and professor, Case Institute of Technology, Ray T. Bayless, acting managing director A.S.M., and E. E. Thum, editor-in-chief, Metal Progress

Specimens of minerals ranging in size from 1 to 8000 lb. have already been received by the American Society for Metals for eventual inclusion in the mineral garden that will be a spectacular educational feature of the garden piazza of the new headquarters office building now under construction 23 miles east of downtown Cleveland.

The garden, a 100 ft. in diameter saucer with fountains and a "Y" foot bridge, will contain hundreds of mineral ores, all displayed in distinctive, attractive fashion. Each mineral will be named and its donor designated. The garden will be a beautifully landscaped unit in the over-all piazza of the building.

Largest specimen received to date is an 8000-lb. piece of iron ore received from Cleveland Cliffs Iron Co. Lightest in weight is a lump of aluminum ore from the Aluminum Co. of America.

Two radioactive samples have been received and given a friendly Geiger counter checking by a committee of three A.S.M.'ers, Ray T. Bayless, managing director, E. E. Thum, editor-in-chief of *Metal Progress*, and Leslie G. Reardon, A.S.M. building consultant and professor, Case Institute of Technology. One sample, very low in activity, was a 100-lb. garnet rock from the Barton Mines Corp. The other sample, a commercial specimen of uranium ore, was received from the Union Carbide Corp. The latter activated the counter vigorously when tested.

The imaginative and colorful garden will lie immediately beneath the great silvery spider-web-like geodesic space lattice now completed. A symbol of metals progress, the dome rises dramatically 10 stories high above the new building.

C. H. Lorig, A.S.M. president, and technical director, Battelle Memorial Institute, has cordially invited organizations interested in participating in this most unusual educational feature to write A.S.M. for complete details.

Progress on the headquarters building, in spite of the roughest winter in Cleveland's recent history, is moving ahead. Concrete has been poured for the top level of the building which is rapidly swinging outward in its semi-circular design.

Completion of the building is expected in August of this year.

Lorig Guest at Ottawa Valley

C. H. Lorig, national president A.S.M. and technical director, Battelle Memorial Institute, and G. M. Young, immediate past president A.S.M., Aluminum Co. of Canada, Ltd., were guests of honor of the **Ottawa Valley Chapter** at its National Officers' Night Meeting.

Dr. Lorig introduced his talk with a few remarks about the new A.S.M. headquarters building now under construction and then proceeded with a talk on the "Selection of Materials for This Changing World".—**Reported by R. D. McDonald for Ottawa Valley Chapter.**

A.S.M. is the largest publisher of books for the metals industry in the world.

CLEVELAND CHAPTER COMPLETES M.E.I. COURSE

Some 40 Cleveland members of the metalworking industry received graduating certificates Feb. 17 indicating successful completion of the Metals Engineering Institute's course on "Elements of Metallurgy".

Sponsored by the Cleveland Chapter of the American Society for Metals, the course concluded with a dinner meeting in the Cleveland Engineering and Scientific Center.

As guest of honor, Walter Crafts, associate director-technology, Union Carbide Metals Co., Niagara Falls, N. Y., and A.S.M. vice-president, presented the certificates and spoke on the role of the metal scientist today.

He pointed out to the group that "we are in a dramatic period in the development of the metal sciences, for the demands of tomorrow's astro-space age have only just begun to be felt".

"Metals have met and must continue to face the challenges of a growing and rapidly changing technology of bewildering complexity. About 100 years ago metals seriously entered the competition between gun and armor, between offense and compensating defense, that we see now in missiles and anti-missiles. In World War I automotive tanks and aircraft stimulated development of alloy steels and aluminum alloys. In World War II the jet engine began to supersede the reciprocating engine and super-alloys were designed to meet higher temperature requirements. The atomic bomb and nuclear energy demanded development of a whole new class of metals to meet requirements never dreamed of in the past. Since the War, electronic properties have been emphasized by the development of the transistor and purity in metals of a new order has presented a new challenge to metallurgists and physicists. The need for high-strength, light metal brought titanium into production almost overnight".

Mr. Crafts discussed briefly the advances being made towards achieving steel of 1,000,000 psi., indicating the realization of this great strength was "closer than you think".

Mr. Crafts talked also of the growing trend toward A.S.M. chapter sponsorship of M.E.I. courses. Last year, in addition to Cleveland, five other chapters sponsored such courses. (Los Angeles, Golden Gate, Rochester, Worcester, and Warren.) "It is the objective of the American Society for Metals to do its utmost to serve the vital and dynamic need for better metals by providing men with training and knowledge", Mr. Crafts said.

A survey of the Cleveland M.E.I. class personnel revealed that 5% were executives in the field, 80% were technicians and the remaining 15% were involved in sales and drafting.

METALS ENGINEERING INSTITUTE NEWS

The Cleveland Chapter Honor Students Receiving Their M.E.I. Certificates From A.S.M. Vice-President Walter Crafts (Left), at Graduation Exercises in February Were, From Left: Charles J. Hrdlicka, Thompson Ramo Wooldridge, Samuel A. Torchia, Stotter Metal Co., and Harold B. Gilliland, Thompson Ramo Wooldridge. Grades of these three were all above 93%

Awarded "First" Certificates

The first student to graduate from the Metals Engineering Institute course on "Electroplating and Metal Finishing" is Fred M. Wallace of National Electric Products Corp., Ambridge, Pa., supervisor of inspection of metallic tubes and rigid conduits.

Because of the direct relationship between Mr. Wallace's responsibilities and the contents of the 15-lesson course, his study was "very helpful in following products through inspection and quality control".

By studying only three hours each week, the entire course was completed in a little over six months. His appreciation of M.E.I. courses is emphasized by the fact that he has already enrolled in a second course, "Elements of Metallurgy". Although his recent studies have kept him busy, Mr. Wallace still manages time for "hunting, fishing, gardening and spoiling two grandsons".

Fred M. Wallace

Another current "first" is the first graduate in M.E.I.'s course, "Gray Iron Foundry Practice", Gordon M. Reid, Crouse-Hinds Co., Liverpool, N. Y., who was presented his graduate certificate at the December meeting of the Syracuse Chapter.

According to the latest figures, the Metals Engineering Institute has now enrolled over 1400 students in 17 different courses. For more information about M.E.I. courses, see page 33.

METALS ENGINEERING INSTITUTE IS ON THE MOVE

MACHINING OF METALS

Experts look upon the techniques of machining wrought metals, cast alloys, toolsteels, and nonferrous metals. Includes such information as physics of metal cutting, machinability of ingot iron. 177 pages—6x9—cloth—illustrated—$3.00. *Clip and send to Technical and Engineering Book Information Service, 7301 Euclid Avenue, Cleveland 3, Ohio.*

Electroplating Is Reviewed At Warren Chapter Meeting

Speaker: Ronald Shaw

Rockwell-Standard

Ronald Shaw, chief electroplating engineer, Rockwell-Standard, discussed "Electroplating" at a meeting of the **Warren Chapter.**

Mr. Shaw first gave a brief resume of the history of the plating industry, from the days of the harness and bicycle trim soon after 1910, to the present $600-million a year industry in the United States. He compared the volume of plating done in this country with that done in other countries, particularly Australia, Britain and France.

While automotive trim is perhaps the largest customer of the industry it is not the only one. A large amount of nickel was used during World War II as plate where there would not have been enough available to make entire parts of nickel. The printing and engraving industries also use a large amount of plating.

Mr. Shaw spoke of the vast improvements in processing during the past 40 years. Better cleaning of base metal and cleaner solutions have greatly improved the quality of the product, while filtration and ion exchange have improved the effectiveness of the rinse water in plating.—**Reported by H. G. Porter for Warren.**

New Films

Foundry Flexibility

A 16-mm. sound and color film, running 29 min., released by Link-Belt Co., shows production steps and equipment used in one of the nation's most modern foundries. The film is available for free group showing through Link-Belt Co., Dept. PR, Prudential Plaza, Chicago 1, Ill.

Riverfront Story

The R. C. Mahon Co. has released a 15-min. sound and color film which combines human and technical interests to dramatize structural aspects of large buildings and bridges. The film is available by request on organization letterhead, on a no-charge loan basis, directly from R. R. Mahon Co., East 8-Mile Rd., Detroit 34, Mich.

Introduction to Manual Heliarc Welding

A new film presenting an over-all picture of Heliarc welding is available through the Linde Co., Div. of Union Carbide Corp., 420 Lexington Ave., Rm. 2840, New York 17, N. Y. This 16-mm. sound and color film has an 8-min. running time.

From Sea Sands to Better Welding

An 18-min., 16-mm. sound film featuring the steps involved in mining minerals for electrode coatings from the sea sands of Florida, is available without charge from Hobart Brothers Co., Troy, Ohio.

Materials—Key to Progress

Headquarters, U. S. Air Force, has released a new 16-mm. film running 17 min. which portrays the over-all technical mission of the Air Force Materials Research and Development Program and emphasizes the important contributions of industry and science to its progress. This film is available for a period not exceeding two weeks for public nonprofit, nonsponsored television and theatrical exhibition, and is authorized for public sale of prints by United World Films Inc., 1445 Park Ave., New York 29.

Discusses Hard Facing Rod Deposits

R. P. Culbertson, Assistant Technical Director, Haynes Stellite Co., Spoke on "Properties Developed With Hard Facing Rod Deposits" at a Meeting in Texas. Shown are, from left: W. D. Gilder, vice-chairman; Mr. Culbertson; and Joe B. Marx, the chairman of the Texas Chapter

Speaker: R. P. Culbertson

Haynes Stellite Co.

R. P. Culbertson, assistant technical director, Haynes Stellite Co., spoke to the **Texas Chapter** on "Properties Developed With Hard Facing Rod Deposits". Following his talk Mr. Culbertson joined a panel of hard facing experts to answer questions from the floor. The panel consisted of John W. Thomson and Jean S. Wood, Haynes Stellite Co., Ron Arnoldi, Texas Alloy Products, and Allen E. Wisler, Hughes Tool Co.

Hard facing was once a method of repairing worn parts. It has now grown into an industry in its own right in which a wide variety of wear resistant materials are applied at low cost by a wide variety of methods. These include Unionmelt, Heliarc, Sigma, squirt, metallic arc, oxy-acetylene welding, and powder spray depositon. Carbides and ceramic materials can be applied by the latter method.

Wear involves one or more problems which include abrasion, impact, erosion, corrosion, galling and heat. Laboratory methods of evaluating abrasion resistance are not always highly rewarding because of the multiplicity of variables involved.

Mr. Culbertson divided wear resistant materials into four groups.

Group I is a family of iron-base materials containing less than 20% total alloying elements, including C, hot hardness and are resistant to tempering. This group includes a Cr, Mn, Si, Mo. They possess some work-hardening alloy for impact applications. It contains 1.0% C, 4.5% Mn, 14.0% Cr. Its deposited hardness is 28 Rc, and it will work harden to 40-50 Rc.

Group II includes iron-base alloys containing over 20% alloy. Alloying elements employed are C, Cr, W, Mo, Ni, Co and B. One important alloy contains 2.75% C and 27.5% Cr. Its hardness is 45-50 Rc and it is resistant to tempering. The Russians are reportedly using such an alloy for hard facing blast furnace valves.

Group III includes the nickel and cobalt-base alloys to which are added C, Cr, W, B. Those containing tungsten have outstanding red hardness and the group exhibits high corrosion resistance in many environments.

Group IV embraces tungsten and titanium carbides and chromium boride. The carbides may be applied by oxy-acetylene, the metallic arc and squirt processes, using tube rods of steel containing carbide particles in their core.

Mr. Culbertson's talk was generously illustrated with practical uses, methods of application and the metallography of the various alloys. The speaker and his supporting panel of experts answered many questions from the floor.—**Reported by W. B. Brooks for Texas.**

Speaks at Dayton's High-School Night

Shown at the High-School Science Night Meeting Held by the Dayton Chapter Are, From Left: Charles C. Gambill, Frigidaire Division, General Motors Corp., Who Spoke on "Uses of Radioisotopes in Industry"; Walter J. Ridd, Chapter Chairman; and C. H. Perrine and H. P. Gaw, Members

Speaker: Charles C. Gambill

Frigidaire Division
General Motors Corp.

The first High-School Science Night of the **Dayton Chapter** to which several science teachers and students were invited was held to encourage and interest students in the study of science in general, and to introduce students to the A.S.M. and metallurgy in particular.

To add to the success of the meeting, sustaining members were invited to set up informative displays aimed at the student level.

Sixteen exhibits were viewed by the members and 125 visiting science teachers and students. A short movie, "Vacuum Melting of Steel", was also shown, followed by the technical talk by Charles C. Gambill, Frigidaire Division, General Motors Corp., on "Uses of Radioisotopes in Industry". Mr. Gambill first gave some background information on the radiation encountered when using radioactive isotopes, and a brief discussion of alpha and beta particles and gamma rays. Precautions to be observed when using radioactive materials are shielding, adequate distance and short exposure times.

Stable isotopes and their corresponding radioactive isotopes were reviewed, with emphasis on Fe_{59}, which is especially valuable in industrial wear tests since many such tests are concerned with the wear rate of iron alloys.

One industrial application of radioisotopes noted was level gaging, where a radiation source is on one side of a container and a counter on the other for the purpose of telling the level of the material in the container. When the proper level is reached, the contained material absorbs enough of the radiation to either indicate the difference with the counter, or to turn off a valve through a control that operates off the counter. Other applications are transmission gages that record thickness of moving material, such as steel or paper strip, continuously by the amount of radiation absorbed, and reflection gages that have the source and counter on the same side of the gaged material. Reflection gages operate from the amount of radiation that is reflected back to the counter and often used to measure thickness of a coating on another material, such as sponge rubber on steel strip.

Radiography is a well-known use in which internal flaws in castings, etc., are detected and recorded on photographic film. An advantage of this technique over X-rays is that the source can be placed inside a hollow part and film wrapped around the outside. Because of the ability of radiation to ionize air, this factor can be used for static electricity removal. Also, radioactive tracing has been used to find hidden pipes, etc., as well as controlling the proper valves on pipelines, and finding leaks along buried pipelines. Determination of soil removal from materials and evaluation of cleaning compounds have been accomplished by using controlled amounts of radioactive dirt and measuring the amount of radioactivity left after the cleaning operation.

Mixing studies of powders, liquids and gases can be obtained by adding small amounts of an active isotope and noting with a suitable counter just how homogeneous the resulting mix is. Electroplating studies can also be made by use of the proper isotope.—**Reported by D. M. Ashfal for Dayton Chapter.**

Problems in the Use of Beryllium Discussed

Speaker: W. Rostoker

Armour Research Foundation

"Beryllium—Why" was the title of the talk given at a meeting of the **Chicago-Western Chapter** by W. Rostoker, assistant manager, metals research, Armour Research Foundation of Illinois Institute of Technology.

The current interest in beryllium is justified on the basis of its physical and mechanical properties which make it a desirable material for both nuclear energy applications and ultra-high performance manned and unmanned air vehicles. Thus, its low cross-section makes it an ideal metal for the former application whereas its high modulus of elasticity, low density and high heat capacity are particularly suitable for the latter application.

A recently published critique on a nearly all-beryllium turbojet airplane has shown that such an aircraft is feasible even at the present cost of the metal because of the weight saving. Unfortunately, while the mechanical properties which are of interest to the designer look good, the fabrication characteristics are very poor because of its lack of ductility. None of the methods of producing beryllium thus far has yielded sheets with sufficient ductility to withstand forming operations inherent to aircraft frame fabrication.

In the development of metals and alloys now in common use, problems which at the time appeared unsurmountable have been solved. Similarly, the factors which will enhance the ductility of beryllium can be expected to be solvable.

Dr. Rostoker suggested that attainment and control of the following conditions could play a major role toward the ultimate goal: (1) High-purity beryllium with no silicon, aluminum or magnesium; (2) structural cleanliness (i.e., avoidance of BeO); (3) small grain size, particularly important in low-temperature applications; (4) minimum degree of preferred orientation, important since beryllium has a hexagonal crystal structure and consequently a limited number of slip systems; and (5) cold work above brittle-ductile transition temperature to lower such transition (rheotropic recovery).

Under some conditions, such as airborne powder dust, beryllium may be toxic for some people; however, this does not mean that the metal cannot be handled, but rather that proper precautionary measures must be exercised.

In closing, Dr. Rostoker stated that, on paper, beryllium could make some fantastic air vehicles; however, there are still difficult-to-solve problems to be overcome. Availability and price are a big drawback now, but this could change if the ductility problem is solved and its performance tested in an actual vehicle.—**Reported by D. J. Garibotti for Chicago-Western.**

Reviews Developments in Alloy Steel at Rochester

Speaker: Walter Crafts

Electro Metallurgical Co.

Members of the **Rochester Chapter** heard Walter Crafts, vice-president A.S.M., and associate director-technology, Electro Metallurgical Co., speak at the National Officers' and Past Chairman's Night meeting. Mr. Crafts spoke on "Recent Developments in Alloy Steel".

New developments in alloy steels have resulted from the needs of users, improvements in processes and re-evaluation of existing knowledge. Studies of the principles of alloy behavior and substitution of alloys in periods of scarcity have given us a basis for versatile use of the available alloying metals. Trends in the sources of metals from the rich bonanza ores to leaner, but more complex ores, suggest that even greater flexibility will be needed in the future.

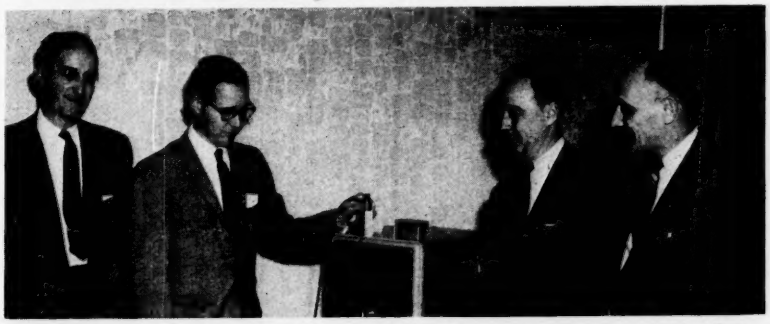
Demands for more improved properties have been imposed by aircraft, missiles, nuclear energy, power plant and chemical processes. Ultra-high-strength steels have been developed to a useful degree as a result of hardening and tempering reactions as well as by imaginative engineering of their fabrication and usage.

Hardenability studies have provided a base line for study of secondary differences in hardenability and mechanical properties that can be expected to become even more important in the design of steels. A recent Russian development has pointed out unusually high hardenability in manganese steels containing strong carbide-forming elements like vanadium and titanium. This has emphasized the need for study of alloying effects on austenite and transformation.

Developments in austenitic stainless steels for high-temperature service were outlined. Several types of hardenable austenitic steels were described. The chromium-manganese-nitrogen-nickel austenitic steels were characterized and their modifications for service at temperatures up to 1400° F. were discussed. The precipitation hardening high-temperature stainless steels have been greatly improved by small additions of boron or zirconium and by vacuum and cold mold melting for better cleanliness and mechanical properties. These developments have successfully expanded the use of steel to higher temperatures in sheet and small castings and wrought castings.

There are still expressed needs for higher strength steels in aircraft and for steels that can be used in heavier sections for power and chemical plants. Research in the direction of better steels is continuous and further developments to extend their utility can be anticipated.—**Reported by J. V. Hurley for Rochester.**

Cites Reasons for Failures in Metals



H. E. Van Valkenburg, Sperry Products, Inc., Demonstrates a Reflectoscope at a Meeting in Buffalo. Shown are, from left: John Lamont, chairman; Mr. Van Valkenburg, who spoke on "Ultrasonic Inspection of Metals"; John Webber, program chairman; and R. Frank, application engineer

Speaker: H. E. Van Valkenburg

Sperry Products, Inc.

H. E. Van Valkenburg, supervisor of engineering research, Sperry Products, Inc., presented a talk on "Ultrasonic Inspection of Metals" at a meeting in **Buffalo.**

Mr. Van Valkenburg gave an overall picture of the field of high-frequency sound for ultrasonic nondestructive testing. The combination of being able to test parts without destroying them, in addition to the flexibility of this method as to size of parts and convenience of being able to test from one side for flaws, makes this type of testing extremely versatile and useful in almost all fields.

With the aid of a well-planned series of slides the speaker presented the theory of sound transmission in metals and then discussed methods of using sound to test metals, either by transmission through metals or reflecting or refracting it in them. He went on to show methods for generating high-frequency sound waves with quartz crystals and then directing and controlling them to do different useful jobs. Discussion of equipment for testing and examples of different kinds of jobs completed the lecture.

The major part of the talk was devoted to the practical aspects of ultrasonic testing and its place in the nondestructive test field in relation to other tests, such as magnetic or X-ray. By this method parts can be tested for thickness or bond or hidden flaws from one side. Also, flaws covered in such a way as to make them inaccessible by other means of testing, such as cracks or defects in shafts of turbines and flywheels, can be detected. This method can also test to great depths. Examples of 30 to 40-ft. parts tested were given. It was also explained how this kind of testing can be used in conjunction with X-ray testing because the sound beam is most sensitive to voids oriented in a plane perpendicular to its direction of travel while the X-ray is weak to such an indication and strong to one in the parallel plane where ultrasonic is least sensitive. The nature of this method also allows it to be mobile and it can, when necessary, be taken to the part requiring testing.—**Reported by M. A. Grobe for Buffalo.**

Explains Continuous Casting At Meeting in Syracuse

Speaker: C. E. Swartz

Consulting Metallurgist

Members of the **Syracuse Chapter** heard Carl E. Swartz, consulting metallurgist, speak on "Continuous Casting—the Properzi Process".

Continuous casting is a technique in which the ingot is continuously solidified while it is being poured. The concept of the process has been in existence for many years but power requirements and design concepts have held up progress until recently. However, practical continuous castings were being poured by 1928.

Two methods are primarily used in continuous casting, one where there is relative movement between the mold wall and the metal being cast, and the second where there is little or no movement. Dr. Swartz spoke of a number of different techniques that are or were employed and illustrated these with slides.

The latter part of his talk was taken up with the newest and most unique method of continuous casting, the "Properzi Process", which utilizes a casting wheel and a rolling mill, and the end product is a wrought material. The cavity in the rotating wheel is filled, closed by a steel belt and emerges as a triangular solid bar which is fed into the rolling mill.

Dr. Swartz concluded by giving the advantages of continuous casting. It is a high-speed operation, involves less labor, makes more efficient use of the metal, and thus over-all is cheaper.—**Reported by G. Trojanowski for Syracuse.**

Review Reactive and Refractory Metals

James Wong and Douglas Kaufman, Nuclear Metals, Inc., Talked on "Reactive and Refractory Metals" at a Boston Meeting. Shown are, from left: J. Martin, Drs. Kaufman and Wong; and W. McCarty, program chairman

Speakers: James Wong and D. Kaufman

Nuclear Metals, Inc.

James Wong and Douglas Kaufman, Nuclear Metals, Inc., spoke at a meeting of the **Boston Chapter** on "Reactive and Refractory Metals".

Dr. Wong defined refractory metals as metals which should possess, in addition to high melting points, usable strength at elevated temperatures.

He explained that the application of refractory metals in nuclear reactors has been limited due to their relatively high neutron absorption characteristics. However, refractory metals like vanadium and columbium have found use in fast reactors such as the English Dounreay Reactor where the neutrons are not as readily absorbed.

Some of the refractory metals discussed were columbium, tungsten, molybdenum, tantalum and vanadium. Also mentioned were the rare refractory metals like rhenium, osmium and ruthenium. Molybdenum alloyed with 35% rhenium is very ductile, possesses good high-temperature strength and can be cold worked at room temperature from the cast state. However, if the rhenium content exceeds 35%, it loses its ductility. Studies are now underway to determine the binary and ternary phase diagrams of rhenium, osmium and ruthenium with other refractory metals.

Dr. Wong discussed two commercial methods, powder metallurgy and arc casting, for the preparation of the refractory metals. He stated that powder metallurgy methods usually required a pressing, sintering and then a working operation as a final step to improve mechanical properties. Arc casting of refractory metals can be used to produce large ingots. Suitable precautions must be taken to avoid intergranular fracture due to the large columnar grains. Extrusion was mentioned as one desirable method.

Properties desired of a refractory metal are as follows: high strength at elevated temperatures; room temperature ductility; a high recrystallization temperature; oxidation resistance; weldability and fabricability; and abundance.

Oxygen, carbon and nitrogen affect the property of refractory metals. This is shown by their influence on the transition temperature.

Dr. Wong concluded by listing the precautions necessary in fabricating refractory metals:

1. Require greater deformation force than for normal metals.
2. They react to atmospheric exposure.
3. The surfaces of the tools used for deformation need to be lubricated to prevent galling.

Extrusion is said to be an ideal process for the deformation of refractory metals. The material can be "canned", protected by heating in salt or glass which, in turn, also acts as a lubricant. Salt heating technique is used for fabricating molybdenum.

Dr. Kaufman defined reactive metals as metals which are very difficult to reduce to the metallic state from the natural ore or chemical derivative. Among those mentioned were titanium, zirconium, hafnium, thorium and beryllium. The methods used to obtain the metallic state are: use of powerful reducing agents; and the use of the Kroli process, particularly for titanium, zirconium, hafnium and thorium.

Lately, the skull crucible method for melting has become popular, but it has not been developed for large tonnage yet. This technique can be used to overcome inhomogeneity of the electrode. In the electrolysis of these metals, the oxidation-reduction effect at the electrode makes it difficult to reduce. Generally, alloys of these metals are produced by arc melting.

Some of the more unique properties of these metals are: High affinity for hydrogen; high oxygen and nitrogen absorption at high temperature; relatively high chemical inertness. Some of the nuclear applications of the reactive metals are: fuels, cladding, moderator and shielding materials.

Dr. Kaufman concluded his talk by explaining briefly each of these applications.—**Reported by Stephen G. Demirjian for Boston.**

Lorig at Joint Chicago Meeting

National President C. H. Lorig, Technical Director, Battelle Memorial Institute, Spoke at a Combined Meeting of Chicago and Chicago-Western Chapters on "Selection of Materials in This Changing World". At the meeting were, from left: R. H. Read, technical chairman; Dr. Lorig; W. Wilson, Chicago chairman; and R. W. Hanzel, Chicago-Western chairman

Gives Pointers on Solving Some Industrial Problems

Speaker: D. Shainen
Rath & Strong, Inc.

At a meeting of the **Baltimore Chapter,** D. Shainen, industrial consultant, Rath & Strong Inc., gave a talk entitled "Breaking Through the Industrial Problem Barrier", in which he pointed out that there are times when a nonconventional approach to a problem can lead to a surprisingly successful outcome.

In most industrial firms today many manhours of effort are devoted to troubleshooting, research and product development. The procedures generally followed to accomplish these aims, called the common sense approach, are (1) to observe, (2) to explain, (3) to try and (4) to prove you can control it. When these approaches are tried several times with disappointing results we have what we would call an industrial problem barrier.

In order to break through, step two has to depend on what seems to be a cause-and-effect relationship. The four logical approaches would be: An effect has one or more causes; some causes have more influence; a cause may not have constant activity; find the important causes for an effect by studying the effect of time to time; variation from unit to unit; and variation within a unit.

Mr. Shainen closed by stating that the results of any statistical methods should be thoroughly checked before a problem can be said to be satisfactorily solved.—**Reported by John A. McKay for Baltimore Chapter.**

Gives Zay Jeffries Talk in Cleveland

At the Zay Jeffries Night Meeting in Cleveland, H. P. Crofts, Kennecott Sales Corp., Spoke on "Columbium". Shown, from left: K. Humberstone, chairman; W. Baldwin, technical chairman; Mr. Crofts; and C. Junge

Speaker: Harry P. Crofts
Kennecott Sales Corp.

Harry P. Crofts, Kennecott Sales Corp., spoke on "Columbium" at the Zay Jeffries Night in **Cleveland.**

Columbium is not a rare metal. Its prevalence in the earth's crust is 3 to 4 times that of molybdenum, and at least 11 times that of tantalum, and there are estimated world reserves of over 5,000,000 tons of the metal. While present production is largely from columbite concentrates from Nigeria, ultimate large-scale tonnage will come from the pyrochlore deposits of Canada, Brazil, United States, Tanganyika, Uganda and Norway. Columbium's combination of properties, including high melting point, medium density, low transition temperature, low neutron cross section and extreme malleability, together with its high resistance to corrosion, indicate that the metal itself and columbium-base alloys should find appreciable markets.

Its present use in ferrocolumbium has been confined to columbium stabilized austenitic stainless steel and to the so-called superalloys. After a setback due to Government stockpiling and restrictions, together with an artificial high price, columbium is regaining its warranted position in the austenitic stainless steels where, due to its ion oxygen affinity, it does not introduce streaks and cracks which are encountered with other stabilizers. In the superalloys columbium is used up to 4% to improve high-temperature strength and resistance to thermal shock.

In titanium alloys it is used to deter the onset of brittleness encountered with higher than normal aluminum contents at 1000 to 1200° F.

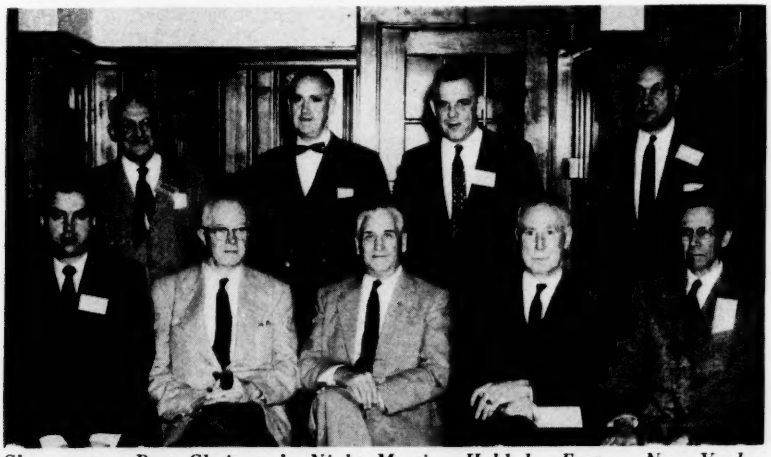
Columbium has been recently introduced into low-alloy and carbon steels where it produces fine grain size without the deleterious effects encountered with some other grain refiners, and when present in amounts ranging from ¼ to 4 lb. per ton, raises the yield and tensile strengths in appreciable amounts depending, of course, upon the steel and the treatment, and at the same time does not detract much from the ductility.

Columbium metal shows some promise for nuclear energy applications due to its low neutron cross section, its high ductility and its resistance to corrosion, particularly from liquid metals.

Columbium-base alloys have been receiving a vast amount of investigation work. Some have been developed to have oxidation rates lower than 1 mil in 100 hr. at 2000° F., others show tensile strength of 75,000 lb. per sq. in. at 1800° and 50,000 lb. at 2000°, with stress rupture strengths for 100 hr. of 45,000 psi. at 1800° and 30,000 psi. at 2000°.

Efforts are continuing to develop ductile alloys which will have both high oxidation resistance and high stress rupture strength at temperatures above 2000°. — **Reported by Howard Boyer for Cleveland.**

Eastern New York Past Chairmen Meet



Shown at a Past Chairman's Night Meeting Held by Eastern New York Chapter Are, Front, From Left: J. H. Westbrook, Present Chairman; W. F. Hodges (1948); F. C. Kelley (1933); A. W. Merrick (1923); and M. F. Sayre (1928). In back row, from left, are: W. E. Ruder (1925); J. C. Davidson (1953); B. D. Ellis (1951); and C. L. Richards (1949)

Panel Covers Metals in Architecture

"Metals in Architecture" Was the Subject Discussed at a Panel-Type Meeting Held Recently by the Pittsburgh Chapter. Members of the panel included, from left: William B. Pierce, Allegheny Ludlum Steel Corp.; Frederick J. Close, Aluminum Co. of America; Dahlen K. Ritchey, D. K. Ritchey Associates; and J. F. Ingram, Ingram Richardson Mfg. Co.

"Metals in Architecture" was the topic discussed by a panel at a meeting of the **Pittsburgh Chapter.** Dahlen K. Ritchey, D. K. Ritchey Associates Architects, was panel moderator. Panel members included J. F. Ingram, president, Ingram-Richardson Manufacturing Co., William B. Pierce, vice-president, sales, Allegheny-Ludlum Steel Corp., and Frederick J. Close, vice-president in charge of commercial research and sales development divisions, Aluminum Co. of America.

Mr. Ritchey started the discussion by giving a sketch of the role of metal in the history of architecture. The Ancients used stone, wood and masonry exclusively, using metal only for minor roles such as keys, binding stone blocks together, and for iron bars to hold heavy entablatures in place. The age of steam, with its prerequisites of large open spaces for factories enclosing large machinery, brought about the development of the truss to replace wooden beams which limited the span size. Wood was first used for the truss, followed by cast iron, then wrought iron, and finally steel. Textile factories in New England were the first users of metal architecture, their structure employing cast iron columns.

A few pre-Civil War buildings in the East had cast iron facades, a forerunner of metal for a facing material. The culmination of iron was the Eiffel Tower in Paris with its 7000 tons of iron structure prefabricated at the iron works before its erection.

The modern use of aluminum first came about in 1926 when an aluminum spire was constructed for the Smithfield Evangelical Protestant Church in Pittsburgh. This same city is also the home of the first aluminum skyscraper, the Alcoa Building.

Mr. Ritchey remarked that the present trend in architecture is to use metal almost entirely for such things as curtain walls, structure, walls, doors, frames, furniture, and even metallic fabrics in drapes.

Mr. Ingram discussed the use of colored porcelain-enameled panels for curtain wall construction. Slides were shown of many attractive buildings recently constructed using this material, including the first major building using porcelain-enameled panels, the Ford Motor central staff building in Dearborn, Mich.

Mr. Ingram cited six factors in the growth of porcelain-enameled panels for curtain wall construction. These are:

(1) Color—there are 2007 different colors on file at Ingram-Richardson.

(2) Sculptured and textured panels—which are available for unusual effects.

(3) Technical developments—which have produced bigger panels and porcelain-enameled aluminum panels.

(4) Modernizing and remodeling present structures.

(5) Standardization.

(6) Changing of building and fire codes.

Mr. Pierce pointed to the part Pittsburgh has played in the growth of metal in architecture due to its renaissance and the rebuilding of its downtown area. The U. S. Steel Building, the Childrens' Hospital, and the new Civic Auditorium, with its stainless steel retractable dome, were mentioned as examples of the recent use of stainless steel. Mr. Pierce also discussed the use of color in stainless steel panels such as the black panels and columns in the new Bethlehem Steel Building. He mentioned the advantages of the almost zero maintenance of such buildings. He outlined the job ahead for research in fabrication problems, especially window construction, the use of rolled sections, correct gages, better finishes, and the part they play in cost of competitive metals.

In Mr. Close's presentation of the use of aluminum in architecture, he remarked about the availability of aluminum in all forms, such as structural members, rod, bar, wire and extrusions. This flexibility of forms lends itself well to the architects' use. Aluminum, in addition to its workability, is easily fabricated by welding and brazing. It can be colored by anodizing or porcelain enameling.

Mr. Close stressed Alcoa's cooperation with the architects, such schools as Penn State and M.I.T. and their own research department, together with others in the development of aluminum in architecture. He also urged the research and development departments of the various metals industries to work on such problems as getting moisture out of paneled walls. Another important job for the metal industry is to promote public acceptance of metals in architecture.

In the summary discussion in open panel, all of the panel members agreed to the task of bringing about changes in the building codes for greater acceptance of metal curtain walls and the importance of both industry's and the architects' close cooperation in avoiding monotony in metal curtain wall design.—**Reported by D. W. Gunther for Pittsburgh.**

Cincinnati Hears President Lorig

C. H. Lorig, National President A. S. M., Who Gave His Talk on "Selection of Materials in This Changing World" at a Cincinnati Meeting, Is Shown, Center, With Fred Westermann, Left, and Fred Robertshaw, Right

CHAPTER MEETING CALENDAR

Akron	**Apr. 15**			National Officers Night
Albuquerque	**Apr. 16**		**R. E. Marburger**	Measurement of Residual Stresses by the Use of X-Rays
Baltimore	**Apr. 20**		**P. G. Nelson**	Deep Drawing of Carbon and Stainless Sheet
Birmingham	**Apr. 7**	Redstone Arsenal	**Karl J. Pschera**	Material Problems in Space
Boston	**Apr. 3**	M.I.T. Faculty Club		Sauveur Night
British Columbia	**Apr. 9**			Film Night
Buffalo	**Apr. 9**	Continental Inn	**J. Y. Riedel**	Improving Production From Tools and Dies
Calumet	**Apr. 14**	Teibel's Restaurant		Ladies Night
Canton-Massillon	**Apr. 7**			Cold Forging Operations
Carolinas	**Apr. 19**		**A. E. Focke**	Metallurgical Horizons Unlimited
Chicago	**Apr. 13**	Furniture Club of America	**O. Zmeskal**	Engineering Education
Cincinnati	**Apr. 1**	Westinghouse Plant		Tri-Chapter Meeting
Cleveland	**Apr. 6**	Cleveland Engineering Society	**Panel**	Castings Vs. Forgings Vs. Weldments
Columbia Basin	**Apr. 1**		**E. T. Hayes**	Metals Activities of the Bureau of Mines
Columbus	**Apr. 1**	Westinghouse Plant		Tri-Chapter Meeting
Dayton	**Apr. 1**	Columbus		Metallurgy and Future Economics
Delaware Valley	**Apr. 15**		**A. E. Schub**	Centrifugal Casting
Detroit	**Apr. 13**	Rackham Memorial	**J. H. Hollomon**	New Horizons in Metallurgy
Eastern New York	**Apr.**	Panetta's Menands		Solidification of Castings
Fort Wayne	**Apr. 13**	Hobby Ranch House	**V. E. Lysaght**	Microhardness Testing of Metal
Hartford	**Apr. 14**	Indian Hill Country Club	**R. R. Leo**	Cold Heading Materials
Indianapolis	**Apr. 20**		**R. W. Lindsey**	Ultra High-Strength Alloy Steels
Lehigh Valley	**Apr. 3**	Hotel Traylor	**Panel**	Students Night
Long Island	**Apr. 15**	Patricia Murphy's Candlelight	**H. J. Williams**	Magnetic Domains in Single Crystals and Evaporated Films
Louisville	**Apr. 7**	White Cottage	**W. R. Clough**	Flow and Fracture of Metals
Mahoning Valley	**Apr. 14**	Mural Room	**W. D. Doty**	Welding of Alloy Steel
Milwaukee	**Apr. 21**	American-Serbian Memorial Hall	**K. T. Aust**	Structure and Properties of Grain Boundaries
Minnesota	**Apr. 22**		**R. H. Aborn**	Toughness Without Tempering
Montreal	**Apr. 6**	Queen's Hotel	**W. Glover**	Electroplating and Metal Finishing
Muncie	**Apr. 1**			Ladies Night
New Jersey	**Apr. 30**		**E. J. Krabacher**	Machinability of Metals
New York	**Apr. 6**	Brass Rail Restaurant	**Frank LaQue**	Materials for Space Travel
North Texas	**Apr. 8**		**C. H. Lorig**	A.S.M. Activities and Future Plans
Ontario	**Apr. 3**	Beacon Motel	**J. Rannalls**	Metallurgist's Role in Canada's Atomic Power Program
Penn State	**Apr. 13**			Nuclear Materials
Philadelphia	**Apr. 24**	Engineers Club	**E. R. Breining**	A Glimpse of Gas Plating
Philadelphia (Jr. Section)	**Apr. 1**	Engineers Club	**Craig Hood**	Nondestructive Testing
Pittsburgh	**Apr. 9**		**D. J. Carney**	Large Electric Arc Furnace Steelmaking in the U.S.A.
Purdue	**Apr. 8**			Symposium
Richmond	**Apr. 15**	Holloway House	**E. E. Stansbury**	National Officers Night
Rochester	**Apr. 13**	Manger-Seneca Hotel	**H. H. Brown**	Practical Aspects of Corrosion Problems
Rockford	**Apr. 22**	Hotel Faust	**C. L. Faust**	Some Aspects of Surface Coatings
St. Louis	**Apr. 16**	Stratford Hotel	**Panel**	Stump the Experts
Saginaw Valley	**Apr. 14**	High-Life Inn	**D. J. Carney**	Steel Industry, Education and Research in Russia
Savannah River	**Apr. 9**		**J. B. Rutherford**	New Developments in Tubing Manufacture
Southern Tier	**Apr. 13**	O'Brien's Restaurant	**Weston Morrill**	Magnetic Materials
Springfield	**Apr. 20**	Gables	**Neil Culp**	High-Speed Steel
Syracuse	**Apr. 7**	Onondaga Hotel	**J. Sullivan**	Statistical Methods
Texas	**Apr. 7**	Engineers Club	**C. H. Lorig**	Brittle Behavior of Ferritic Steels
Toledo	**Apr. 9**	Maumee River Yacht Club	**S. R. Prance**	Toolsteels
Tri-City	**Apr. 14**			Plant Tour
Tulsa	**Apr. 7**	Alvin Hotel	**George Benz**	Can Everyone Be an Engineer?
Utah	**Apr. 2**	Panorama Inn	**C. H. Lorig**	Selection of Materials in This Changing World
Western Ontario	**Apr. 10**	London	**Tour**	Wolverine Tube Co., Ltd.
West Michigan	**Apr. 20**			Tour
Wilmington	**Apr. 8**	New Brandywine High School	**A. J. Shaler**	Opportunities and Rewards in Metallurgy
York	**Apr. 8**	Gettysburg	**J. F. Victory**	Problems in High-Speed Air Flight and Supremacy of the Air

Describes Materials for Auto Engines

At a Meeting of Eastern New York Chapter, W. R. Kiessel, Ford Motor Co., Spoke on "Automotive Engines of Tomorrow". He is shown, center, with J. H. Westbrook, chairman (left), and S. Yukawa, technical chairman

Speaker: W. R. Kiessel
Ford Motor Co.

At a meeting of the **Eastern New York Chapter,** W. R. Kiessel, supervisor of applied research, Steel Division, Ford Motor Co., discussed "Automotive Engines of Tomorrow".

Dr. Kiessel outlined the operation of the gas turbine and free piston engines. Gas turbine engines are more demanding in their material requirements than the free piston engines. High temperature and oxidation are the primary problems. Although materials are available that can solve the problems, they are too expensive for production automobiles.

Material considerations have caused a change from a regenerative preheat to a recuperative one. The present system uses austenitic stainless steels, but some work has been done with nickel-plated mild steel recuperators.

Considerable work has been done with Fe-Al alloys used for burner cans and high-temperature shielding. Special melting techniques have produced Fe-Al alloys with good fabrication properties up to 10% Al.

Another problem is the high-temperature turbine wheel. Nickel-base alloys are being used. The turbine buckets and ring are investment cast.

The speaker discussed the possibility of die casting aluminum internal combustion engines. A wet sleeve construction (i.e., cast iron cylinders in aluminum block) is possible.

New processing techniques, such as electroless deposition of a brazing compound on an assembled regenerator prior to heat treating, the extrusion of the turbine wheel hub about cast buckets, shell casting of buckets, etc., were also discussed.—**Reported by Louis Ianniello for Eastern New York.**

Lorig at Northeast Pennsylvania

National President C. H. Lorig, Battelle Memorial Institute, Presented a Talk on "Selection of Materials in This Changing World" at a Meeting of Northeast Pennsylvania Chapter. Shown are, from left: F. R. Yurkoski, secretary-treasurer; Dr. Lorig; H. L. MacGregor, chairman; and Robert L. Ward, vice-chairman. (Reported by John J. Penkoske)

Properties of Ta, Cb, W and Mo Discussed at Columbus

Speaker: R. Wehrmann
Fansteel Metallurgical Corp.

Members of the **Columbus Chapter** heard Ralph Wehrmann, assistant director of chemical research, Fansteel Metallurgical Corp., speak on "Preparation and Properties of Tantalum, Columbium, Tungsten and Molybdenum".

Advancement of high-temperature technology is being retarded by lack of structural material which will remain strong at the higher temperatures. However, with some developments to help overcome particular disadvantages, these metals might be able to raise working temperatures by some large increment.

Dr. Wehrmann discussed the history, sources, uses, cost, consumption in the United States, methods of preparation and properties of the four metals. He showed, with slides, how Fansteel makes bar stock and parts of tungsten, starting with the ore concentrates and ending with the finished products.

He concluded with a short resume of the work being done to overcome the low oxidation resistance of these metals, both by protective coating and by alloying.—**Reported by Milton Weiner for Columbus.**

Casting Process Advances

Speaker: H. H. Harris
General Alloys Co.

"Advances in Casting Process and Product Through Integrated Specific Casting Design-Process-Metallurgy" was the title of a talk presented by H. H. Harris, president, General Alloys Co., at **Rochester.**

Mr. Harris stated that forgings have twice the yield of regular castings. However, tubular castings are comparable to forgings.

Advantages of tubular castings are:

1. Superior to forgings in hydrostatic tests and fatigue life.
2. Less machining cost and time to produce a casting.
3. Closer dimensional castings.
4. Particularly applicable to highly stressed parts.

High quality castings are obtained because:

1. Ceramic gating controls predetermined rate of flow.
2. Chrome plated cast iron patterns or graphite molds assure tubular castings accurate to 0.001 to 0.002 in. per section.
3. Rotating induction heated gates allow bottom pouring of 400-lb. castings through ¼-in. nozzle resulting in uniform grain size, free from shrinkage cracks, cold shuts and nonmetallic inclusions.

High-quality castings are possible only if casting design, process and metallurgy are integrated.—**Reported by J. V. Hurley for Rochester.**

EMPLOYMENT SERVICE BUREAU

The Employment Service Bureau is operated as a service to members of the American Society for Metals and no charge is made for advertising insertions. The "Positions Wanted" column, however, is restricted to members in good standing of the A.S.M. Ads are limited to 50 words and only one insertion of any one ad. Address answers: c/o A.S.M., 7301 Euclid Ave., Cleveland 3, O., unless otherwise stated.

POSITIONS OPEN

East

ENGINEER: Excellent opportunity to join national staff of society in New York City. Responsibilities to include representation on technical committees, editing of standards, answering technical inquiries from industry. Applicant must have degree in engineering, with at least three years experience, preferably in welding or allied fields. Salary commensurate with qualifications and experience. All replies held in confidence. Box 3-5.

METALLURGIST: Research center of multi-plant manufacturer of precision mechanical springs and spring steel, needs metallurgist with three to eight years experience for research and production on the cold rolling, forming, annealing and hardening of high-carbon, high-strength and high-temperature steels. Box 3-10.

METALLURGIST: With experience in tool-steels, especially high-speed steels, required by well-known small New England cutting tool manufacturer, to work on research and development, troubleshooting and quality control problems. Excellent opportunity with a growing concern. Send resume. Box 3-15.

West

PHYSICAL METALLURGIST: B.S. in metallurgy minimum requirement, M.S. in metallurgy preferred. Desire good experimentalist with background in physical and mechanical metallurgy. Position involves fundamental research on properties of high-temperature alloys and design of new testing apparatus. Excellent opportunity to work with a senior scientist in an aircraft research organization in Los Angeles. Box 3-20.

TEACHER OF METALLURGY: Position available Sept. 1, 1959, rank and salary to be determined by qualifications. Applicant should have Ph.D. or equivalent, either extractive or physical. Write: C. W. Haynes, Head, Dept. of Metallurgy, Montana School of Mines, Butte, Mont.

PLANT MANAGER—INVESTMENT CASTINGS: New investment casting plant opened by established foundry. Experienced man required to assume complete responsibility for management of personnel, production purchasing, tooling design, cost estimating. Must be strong in latest methods and metallurgy, ferrous and nonferrous. Send complete resume. Box 3-25.

METALLURGIST, WELDING ENGINEERS, PHYSICAL TEST TECHNICIANS: Major aircraft manufacturer has several attractive opportunities in research, development, shop liaison work for personnel with experience in: heat treating, forming, design consultation, technical writing, properties evaluation, tension-testing, fatigue testing, creep testing, design and fabrication of test equipment, strain gages, failure analysis, aluminum alloys, stainless steels, low-alloy steels, ultra high-strength steels, high-temperature alloys, titanium alloys. Send resume to: R. H. Gassner, B-271, Douglas Aircraft Co., Inc., El Segundo, Calif.

Midwest

METALLURGIST: Recent graduate or graduate with two or three years industrial experience in automotive field. Work will include process control of heat treating and carburizing, metallography, etc. Report writing ability essential. Excellent opportunity for a young man who wants to *work* at metallurgy. Box 3-30.

CHEMICAL OR METALLURGICAL ENGINEER: Recent B.S. or M.S. of recent vintage preferred, to join process development group in research organization. Work involves application of fundamentals of heat transfer, fluid flow, etc., to analysis of iron and steelmaking processes. Send resume, including some detail on academic background, to: J. A. Hill, Research and Development Dept., Jones & Laughlin Steel Corp., 3 Gateway Center, Pittsburgh 30, Pa.

HEAT TREAT METALLURGIST: For position in production steel treating plant. Some knowledge of controlled atmosphere furnaces and generators necessary. Reply to: Michigan Steel Processing Co., 3120 Denton, Detroit 11, Mich.

MECHANICAL DESIGN ENGINEERS: Positions open for capable, imaginative, practical design engineers. Ability, resourcefulness, and journeyman experience given full consideration, although one or more years of engineering college would be desirable. Work on individual assignment under chief engineer and director of research. We have detailers. Projects cover mechanical handling systems and mechanisms pertaining to automatic heat treat and related equipment. Write, phone, or wire resume to: Chief Engineer, Ipsen Industries, Inc., 715 South Main St., Rockford, Ill.

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PHYSICAL METALLURGISTS OR SOLID STATE SCIENTISTS

Argonne National Laboratory has several positions open for Physical Metallurgists or Solid State Scientists to engage in basic and fundamental research on the properties and structures of reactor metals and ceramic materials. Areas of research include metal alloy theory, crystal structures, crystal imperfections, diffusion, irradiation effects in single crystals, plastic deformation, and high temperature properties of ceramics. Excellent facilities available for x-ray and neutron diffraction, optical and electron microscopy, magnetic measurements, and irradiation.

Ph.D. in physical metallurgy or physics and several years' experience in solid state science research or related areas desirable, but recent Ph.D. graduates will also be considered. Previous experience in reactor metal science not essential.

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A NEW ASM BOOK CONTAINING NINE EDUCATIONAL PAPERS ON PRECIPITATION FROM SOLID SOLUTION

NEW DEMANDS UPON METALLURGISTS AND METALS ENGINEERS

"The sputnik age has now thrust new demands upon metallurgists; in many ways the barrier to progress in planes flying faster than Mach 1 is not the sound barrier . . . but the real barrier is that of materials . . . The development of titanium alloys and the research effort expended on molybdenum well illustrate the general point. . . . It is a difficult field; many of the alloys will have 4-5-6 components; understanding their constitution becomes an immensely difficult problem.

We need an Einstein in metallurgy to be able to see into 5 or 6 dimensional space—and some genius—and he would have to be a very great one, to predict what phase constitution in such systems would be, if the fearful amount of the currently necessary experimental work is to be avoided. And we need still another genius to foretell, after all this, how oxidation resistance can at the very same time be provided."

Robert F. Mehl
Dean of Graduate Studies
Carnegie Institute of Technology

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C. G. Bieber and R. J. Raudebaugh, Research Laboratory of the International Nickel Company

PRECIPITATION IN COBALT-BASE ALLOYS
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METALLURGIST: Medium-size research-minded company seeks young engineer for arc-welding research and development group. Good academic record and liking for research required for solving manual and automatic welding problems in mild stainless high-alloy steel and hard-facing areas. Send complete resume and salary expected. Box 3-35.

RESEARCH-ELECTROPLATING: Science or engineering graduate, minimum B.S. degree, to do electroplating research in modern laboratory located in suburban Pittsburgh. Experience desirable but not necessary. Salary commensurate with training and experience. Box 3-40.

METALLURGIST: For research and development work on mild steel and hard surfacing wires to be used in the expanding field of automatic and semi-automatic welding. Age to 40. Send resume and salary requirements to: William T. DeLong, The McKay Co., York, Pa.

METALLURGIST: Research and development work to produce new and improved manual arc-welding electrodes. Area includes mild, alloy and stainless steels and hard surfacing. Also supervision over testing programs to determine conformance of electrodes to various military specifications. Send detailed resume and salary requirements to: William T. DeLong, The McKay Co., York, Pa.

METALLURGIST: experienced in stainless and high-temperature alloys as castings and forgings. Application of these materials to hot working dies in glass industry. Take complete charge of metal development and applications program. Welding experience desirable. Small metallurgical department in large well-known glass company. Minimum B.S. in metallurgy required, preferably three to eight years experience in related fields. Supervisory potential wanted. Box 3-150.

METALLURGIST: Foundry metallurgical engineer for progressive high-alloy steel foundry. To do research and development work on alloys and foundry technical problems. Prefer man with melting background in arc furnaces; however, recent graduate will be considered. Direct correspondence to the Waukesha Foundry Co., Personnel Dept., Waukesha, Wisconsin.

South

METALLURGIST: With corrosion background, wanted for research and development work with high and low-temperature corrosion problems on fuel burning equipment. Salary commensurate with experience. Send resume to: Combustion Engineering, Inc., Employment Supervisor, Industrial Relations Dept., 911 West Main St., Chattanooga, Tenn.

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Box 3-165, Metals Review

METALLURGISTS

Large Metal Fabricating manufacturer in Western New York area has immediate openings for graduate metallurgists with a minimum 10 years experience in hot metal forming industries. Current requirements are for Sales; Production Metallurgy; Research and Development. Send detailed resume indicating past earnings and salary desired. All replies confidential. Write Box 3-180, Metals Review.

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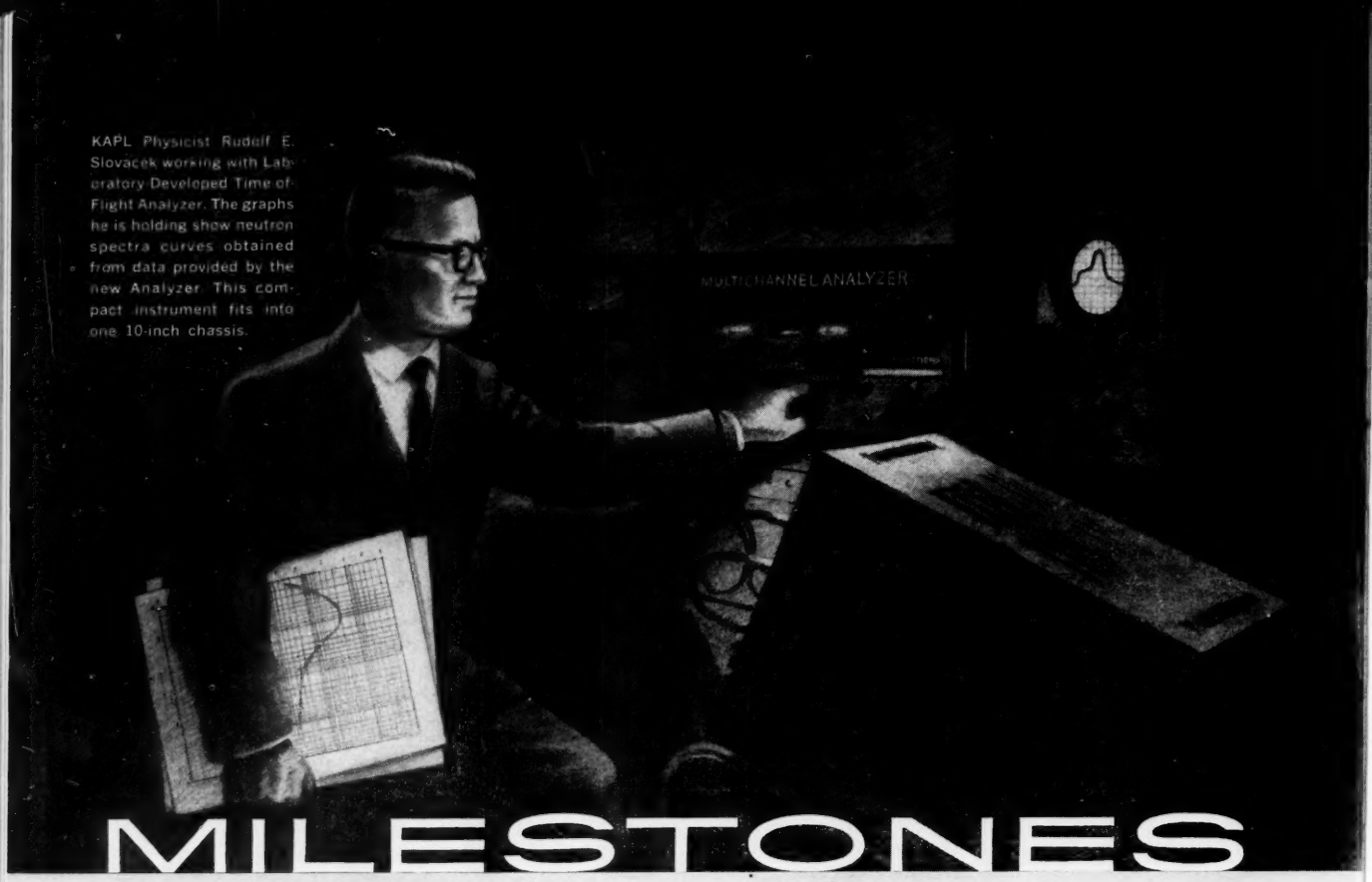

KAPL Physicist Rudolf E. Slovacek working with Laboratory-Developed Time-of-Flight Analyzer. The graphs he is holding show neutron spectra curves obtained from data provided by the new Analyzer. This compact instrument fits into one 10-inch chassis.

MILESTONES IN REACTOR TECHNOLOGY

at The Knolls Atomic Power Laboratory...in Spectra Physics

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Advances such as the Time-of-Flight Analyzer are consistently being made at KAPL, in every technology related to pioneering work in nuclear propulsion for marine applications. Hundreds of KAPL scientists and engineers like Rudy Slovacek are contributing new research findings and techniques in Reactor Physics, Metallurgy, Ceramics, Mechanical Design, and other fields. Projects benefiting from such milestones include KAPL's twin Pressurized-Water Reactors for the Submarine *Triton* and a power plant for the world's first atomic powered destroyer.

PROFESSIONAL OPPORTUNITIES

...exist today for talented physicists, engineers and metallurgists who are interested in contributing to this development. U.S. citizenship required; advanced degree or related experience preferred. Send complete resume and salary requirement to: Mr. A. J. Scipione, Dept. 41-MC.

Rudolf E. Slovacek is one of a number of KAPL scientists concerned with reactor physics. He earned a BSEE at Union College in 1945, joined KAPL in 1951 after taking his MS in Physics at Indiana University. Since then he has contributed to several KAPL projects.

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Southern Research Institute

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Young metallurgist to work in research and development for a large manufacturer of wire and wire products. Involves projects concerned with new or improved products or processes. Detailed records and reports on work done are important as well as work involving planning and carrying out experimental work. Interest or experience in both ferrous and non-ferrous metals is important.

Box 3-155, Metals Review

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METALLURGIST: M.S. degree, age 26. Two years industrial experience in material testing in India, two years research experience in U. S. Prefers employment in the research and development or quality control division of metallurgical industry in the U. S. for 18 months. Box 3-50.

METALLURGICAL ENGINEER: B.S. and M.S. degrees, age 29, married, family. Seven years experience in metallurgical research and development with company engaged in designing and manufacturing aircraft gas turbine engines, three of these years as supervisor of the materials development laboratory. Considerable experience with titanium alloys, high-temperature alloys and steels. Desires responsible position in research and development work. Box 3-55.

METALLURGICAL ENGINEER: Seven years experience in mill metallurgy and line supervision. Aluminum, remelt, extrusion and spectrographic analysis, brass and copper, casting, extrusion, rod and wire alloy development. Experienced on Loewy and Watson Stillmann presses. Desires responsible position in South or West. Minimum salary $10,000. Box 3-60.

MATERIALS—CORROSION-FINISHING ENGINEER: Broad experience and background in above lines, particularly laboratory, technical sales-service and management. Experienced as manager of chemical manufacturing plant and supervisor of surface treatment—corrosion in laboratory covering missile applications. Interested in position with a challenge and long-term connection. Box 3-65.

MECHANICAL ENGINEER: Age 29, married, non-citizen, resident of the U. S. since 1956. Two and one-half years experience in design of heat treating furnaces, three years experience in welding. Desires responsible position in heat treating, design application, and/or welding, in the East. Box 3-70.

METALLURGIST—WRITER: B.S. degree, age 30, veteran. Six years experience in destructive and nondestructive testing and titanium alloy development. Desires position as technical writer or reporter, or responsible position as physical metallurgist. Flexible as to salary and location, provided position is not of a routine nature and offers considerable opportunity for advancement. Box 3-75.

SALES MANAGEMENT: B.S. degree, age 42, married. Studies in business administration and physical sciences. Tool and die maker. Eleven years experience in metal warehouse sales, ferrous and nonferrous metals, foundry alloys. Particular knowledge of heat and corrosion resistant materials. Desires position that will develop into one of administration and management. Located in Southeast, prefers East or Midwest. Box 3-80.

METALLURGICAL ENGINEER: Ph.D. degree in metallurgy and several years experience in teaching, research and industry. Responsibilities have included engineering and teaching, both in administration and instruction, along with direction of graduate research. Desires academic connection which offers opportunity to teach and supervise graduate research in metallurgy with opportunity for professional development. Box 3-85.

METALURGICAL ENGINEER: Graduate degrees in metallurgy, industrial administration. Age 37, married. Fourteen years specialized and supervisory experience with aluminum, magnesium, copper, titanium, tool-steels in extrusion, rolling, drawing and fabrication. Sales engineering, technical service, mill practice, production management, operations and laboratory research. Knowledge of French, German. Desires to affiliate with responsible organization, stateside or international operations. Box 3-90.

POWDER METALLURGIST: M.S. in metallurgy. Four and one-half years diversified experience in high-temperature materials, various cemented hard metals, nuclear materials by powder metallurgy. Desires position with progressive firm in powder metal or nuclear field, preferably in Metropolitan New York. Box 3-95.

EXTRACTIVE METALLURGIST: A.B., chemistry, geology. Age 27, married, family. Experience in extractive metallurgy of refractory metals, hydrometallurgy, minerals benefication, ore-minerals research. Seeks responsible position in location with evening study possibilities. Box 3-100.

METALLURGICAL ENGINEER: B.S. degree, age 33. Eight years experience in process and products development, including two years supervision, reactive metals melting and casting. Desires growth opportunity with progressive company in Midwest. Box 3-105.

METALLURGICAL ENGINEER: M.S. degree. Ten years experience in metallurgical research. Desires Rocky Mountain, Dallas or West Coast location. Box 3-110.

MASS SPECTROMETRY: B.S. in geophysics, geochemistry, age 27, veteran, family. Laboratory experience in metallurgy, nuclear geology and electronics. Desires laboratory or plant work near university facilities. Box 3-115.

PHYSICAL METALLURGIST: Degree, married, family. Experience in research and development, machine too's, alloy development, X-rays, corrosion and fabrication. Desires position in research, development or trouble-shooting. Will relocate. Resume upon request. Box 3-120.

METALLURGICAL ENGINEER: B.S. degree, age 37, married, family. Fifteen years experience in ferrous metallurgy. Openhearth and electric melting superintendent, specialist in heavy forgings, melting and processing of tool and stainless steels. For several years chief plant metallurgist for large steel works. Presently employed. Desires responsible position in production or research. Will relocate, also consider Canada. Box 3-125.

METALLURGIST: M.S. degree, veteran, married. Ten years experience in metallurgical research, mainly with nonferrous metals, covering fields of alloy development, casting problems, vacuum and powder metallurgy. Familiar with extrusion, rolling, other fabricating processes. Desires challenging position with expanding company. Box 3-130.

METALLURGIST: Eight years experience in research, development and troubleshooting. Clear, concise reports. Desires position requiring analysis and development of manufacturing problems. Box 3-135.

INDUSTRIAL METALLURGIST: Sixteen years in metals field, with extensive experience and supervision in tool, stainless carbon and low-alloy steels, controlled atmosphere, salt and other mediums of heat treating. Also experienced in other metal finishes. Desires position as heat treat supervisor or sales engineer in Midwest. Box 3-140.

CORROSION ENGINEER — METALLURGIST: Broad experience in metallurgy and corrosion control in steel and chemical industry. Fourteen years experience in sales, production, fabrication, corrosion mitigation, and consultation with major companies. Desires responsible position in corrosion engineering or sales development. Will consider any location. Box 3-145.

METALLURGIST: Graduate engineer, age 34. Seven years experience in physical and mechanical metallurgy related to development and processing of diversified nonferrous alloys. Experience with alloy steels and use of tool-steels. Supervision. Desires responsible position with progressive concern. Qualified for production, development or technical sales. Prefers Detroit area. Box 3-175.

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Box 3-160, Metals Review

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To expedite your inquiry, forward your complete resume, including salary requirement. Please also include the type of work you are most interested in pursuing at KAPL. Address, Mr. A. J. Scipione, Dept. 41-MCA.

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WELDING ENGINEER

The Armour Research Foundation has an opening for an experienced welding engineer. Applicants should have several years of experience in welding and brazing research with at least a B.S. degree in Welding or Metallurgy.

The Foundation is located on the campus of the Illinois Institute of Technology and encourages graduate engineering study through its education program providing tuition free graduate study, in addition to offering competitive salaries and liberal benefits including generous relocation allowance and vacation program.

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RESEARCH METALLURGISTS

The J&L Research Division wishes to add to its staff in 1959 several professional metallurgists, to broaden the scope of the Corporation's research programs in carbon and stainless steels.

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J&L STEEL

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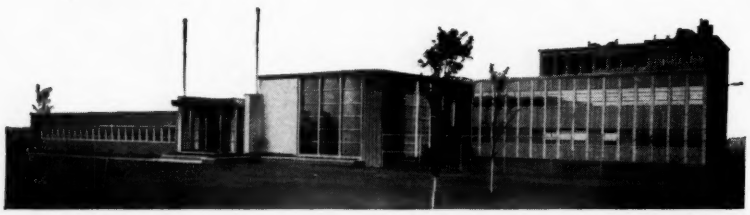

PHYSICAL METALLURGISTS

Expanding programs at the Armour Research Foundation require the services of two imaginative physical metallurgists. Applicants should have several years of research and development experience and be capable of initiating and directing project activity. Advance degree preferred, but will consider B.S. degree personnel with proven record of accomplishment.

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Notice of Change in Publication of A.S.M. Review of Metal Literature

Commencing with the January issue, the *A.S.M. Review of Metal Literature* has been issued monthly as a separate publication. It will be sent without charge to all members of the American Society for Metals *who notify Society Headquarters* of their desire to receive it.

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Fill out and mail coupon below if you wish to continue receiving the *A.S.M. Review of Metal Literature* as a separate publication.

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PARTICIPATE in research on advanced moderator materials. Investigations in field of ionic, covalent and metallic bonding; hydrogen stability in metals at elevated temperatures; kinetics of advanced moderator systems. MS.

PERFORM laboratory investigations in metallurgical melting, casting, fabricating and forming processes. Also phase studies; solid solution alloy studies. MS preferred.

DIRECT studies on materials used in moderator materials development. PhD.

PROGRAM and evaluate specific tests on fuel element materials and assemblies. Compile and publish data. MS, BS, 5-7 years R&D experience.

CONDUCT project technical liaison on materials selection and processing. Develop design data on materials. BS, 5-7 years experience with high temperature alloys.

CARRY OUT liaison with materials subcontractors. BS with 7-9 years experience in development or sales engineering.

ASSIST in development of instrumentation for measuring high temperatures and other instrumentation. MS, BS, 1-3 years experience.

If you qualify, please write in confidence,
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